November, 1947

EDISON ELECTRIC INSTITUTE BULLETIN

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PUBLISHED MONTHLY BY EDISON ELECTRIC INSTITUTE

ELECTRICAL RESEARCH STATISTICS
THE ELECTRIC LIGHT AND POWER INDUSTRY

Current Statistical Data Covering 100 Per Cent of Industry

August, 1946-1947

SOURCE AND DISPOSAL OF ENERGY (In Kilowatthours)—MONTH OF AUGUST

	1947	1946	%
GENERATION* (Net)			
By Fuel Burning Plants	15,690,377,000	13,389,150,000	+17.2
By Water Power Plants	6,053,377,000	6,125,365,000	− 1.2
Total Generation	**21,743,754,000**	**19,514,515,000**	**+11.4**
Add—Net Imports Over International Boundaries	123,800,000	161,155,000	−23.2
Less—Company Use	126,932,000	126,003,000	+ 0.7
Less—Energy Used by Producer	449,077,000	292,787,000	.....
Net Energy for Distribution	**21,291,545,000**	**19,256,880,000**	**+10.6**
Losses and Unaccounted for	3,192,422,000	2,783,279,000	+14.7
Sales to Ultimate Customers	**18,099,123,000**	**16,473,601,000**	**+ 9.9**

CLASSIFICATION OF SALES

NUMBER OF CUSTOMERS—As of August 31st			
Residential or Domestic	30,959,955	29,227,536	+ 5.9
Rural (Distinct Rural Rates)	1,458,331	1,330,013	+ 9.6
Commercial or Industrial:			
Small Light and Power	4,889,790	4,610,645	+ 6.2
Large Light and Power	187,878	172,035	
Other Customers	130,413	119,186	+ 9.4
Total Ultimate Customers	**37,626,367**	**35,459,415**	**+ 6.1**
KILOWATTHOUR SALES—During Month of August			
Residential or Domestic	3,331,678,000	2,899,788,000	+14.9
Rural (Distinct Rural Rates)	680,635,000	547,546,000	+24.3
Commercial or Industrial:			
Small Light and Power	3,252,197,000	2,815,112,000	+15.5
Large Light and Power	9,600,953,000	8,953,140,000	+ 7.2
Street and Highway Lighting	174,538,000	168,145,000	+ 3.8
Other Public Authorities	483,419,000	467,755,000	+ 3.6
Railways and Railroads:			
Street and Interurban Railways	324,321,000	351,679,000	− 7.8
Electrified Steam Railroads	207,622,000	219,888,000	− 5.6
Interdepartmental	43,760,000	50,548,000	−13.4
Total to Ultimate Customers	**18,099,123,000**	**16,473,601,000**	**+ 9.9**
Revenue from Ultimate Customers	**$315,590,400**	**$287,055,200**	**+ 9.9**

RESIDENTIAL OR DOMESTIC SERVICE

AVERAGE CUSTOMER DATA—for 12 months ended August 31st			
Kilowatthours per Customer	1,400	1,300	+ 7.7
Average Annual Bill	$43.68	$42.64	+ 2.4
Revenue per Kilowatthour	3.12¢	3.28¢	− 4.9

(*) By courtesy of the Federal Power Commission.

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EDISON ELECTRIC INSTITUTE BULLETIN

Volume 15 NOVEMBER, 1947 No. 11

The EEI Committees—A Pooling of Talents

PART II

Engineering Committees Battle Rising Costs

This article concludes a detailed description of the important projects to be developed by the Institute's committees during the coming year. The work of the General and Commercial committees was discussed in the October BULLETIN, and this issue covers the plans of the Engineering and Accounting Committees.

COMMITTEES OF THE ENGINEERING DIVISION

THE phenomenon in the past several years of an increasing spread between the price of electricity and the climbing general price index, is to a large extent the outcome of years of continuing researches into specific operating problems that have been carried on by the EEI Engineering Committees. Year by year new developments in equipment, new methods of efficiency, have been reflected in the price the consumer pays for his electricity.

This is what is meant by a *business-managed* electric utility—the proof of its worth is in its business ability to carry its share of its responsibilities as a tax-paying organization, and provide increasingly better service, while keeping down the cost to the consumer of its services. The *business*-men who merit a great deal of the credit for this phenomenon are the members of the committees of the EEI Engineering Division.

Although no engineering committee actually designs a generator or transmission line for use, their most significant work has led to standardized designs in equipment with the aid of industry members and manufacturers. Economies in construction, maintenance and operation have been passed on to member companies through these standardization procedures. Toward these objectives the engineering committees are organized to obtain free and wide interchange of technical information within the industry.

Each committee carries out its functions in the manner best suited to the subject under investigation. The mode of operation will vary from one assignment to the next. Exchange of information is facilitated by informal round table discussion of current technical problems. Special problems are studied by subcommittees and reports are prepared for review by the committee as a whole. Some matters, as for example, certain records of operating experience, are the subject of annual reports that provide a continuing record of progress over the years.

In order to secure the benefit of increased participation from various geographical areas, the committees have diversified their meeting locations, covering a greater area than was possible under wartime restrictions. This has proved mutually beneficial to the committees and to the utility company guests in the various areas in further promoting the interchange of experience.

P. H. CHASE

Chairman of the Engineering Division General Committee—Chief Engineer, Philadelphia Electric Co., Philadelphia, Pa.

From time to time the committees, either individually or jointly with other groups, have sponsored research projects at recognized laboratories to promote the solution of specific engineering problems affecting the industry.

Many of the EEI representatives on joint committees dealing with matters of mutual concern with other industries are drawn from the membership of the engineering committees. All such representatives have ready access to the appropriate engineering committee for guidance as to industry experience and viewpoint.

The standards or recommended practices that are the outcome of the work of engineering committees or joint committees, are in no way enforced upon the member company. The choice is with the individual company to conform with the standards or not. But the committees' work recommends itself on the basis of the economies effected and the breadth of experience from which the standards are drawn. One reward of the engineering committees' work has been general acceptance accorded their recommendations.

Engineering Division General Committee

The Engineering Division General Committee, whose chairman is P. H. CHASE of the Philadelphia Electric Company, coordinates the activities of the five committees in the Engineering Division. Committee chairmen of the five engineering committees and 15

members at large, chosen from amongst the executive engineers in the personnel of member companies, constitute the working body of the General Committee.

In addition to its task of overall supervision, the committee also decides on policy affecting the broad economic interests involved in certain outstanding projects. These projects include the review of codes and standards, recommended construction changes for the improvement of service reliability and emergency service protection methods.

This year the committee is sponsoring a joint committee with the Association of Edison Illuminating Companies on Branch Circuit Protection, under the chairmanship of E. V. Sayles of the Consumers Power Company. The objective of the joint committee is to investigate thoroughly the overcurrent protection of branch wiring circuits with particular reference to residential occupancies, to assist the work of the National Fire Protection Association and other groups.

Electrical Equipment Committee

The Electrical Equipment Committee with CHESTER A. CORNEY of the Boston Edison Company continuing as Chairman, devotes its time to the study of "technical characteristics of electrical equipment and the fundamental principles of design of electrical installations," with reference to the engineering and economic problems involved.

Five subdivisions of the committee have been made to investigate the various branches of this subject. The System Engineering Division, S. M. HAMILL, Chairman, is actively pursuing the following subjects: system planning, intersystem power exchange practices; system generating capacity reserves; and the basis of investment for increased reliability.

CHESTER A. CORNEY

Chairman of the Electrical Equipment Committee—Assistant Vice President, Superintendent of Engineering, Boston Edison Co., Boston, Mass.

During the coming year the Operating and Maintenance Division, E. S. FITZ, Chairman, will put more and more emphasis on the problems of testing, inspection and maintenance of equipment with particular regard to safety practices.

The Apparatus and Design Division, H. B. WOOD, Chairman, continues its studies of oil fires, apparatus troubles, station design, switchgear and generator problems. The committee will continue the practice of holding round-table discussions in closed sessions on apparatus troubles and reviews of new equipment applications.

Large capacity equipment will be the sole concern of the Utilization Division, J. H. FOOTE, Chairman, for the following year. Other problems of utilization devices that are within the sphere of the distribution system have been transferred to the Transmission and Distribution Committee.

The Foreign Practice Group, A. V. DEBEECH, Chairman, will provide for international exchange of information on electrical equipment problems. This division has succeeded in re-establishing contact overseas with many qualified observers and correspondents.

In all there are 57 members of the Electrical Equipment Committee, experienced engineers who will function as working members of the 5 operating divisions.

Hydraulic Power Committee

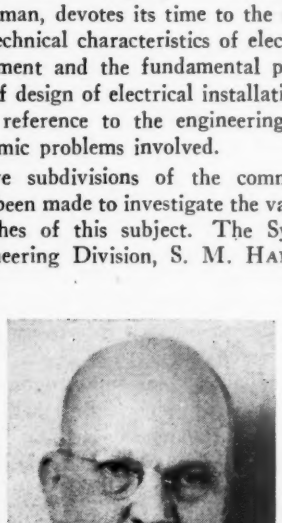
The Hydraulic Power Committee with G. R. STRANDBERG, Stone & Webster Engineering Corporation, as Chairman, has allocated a major portion of its time to consideration of the operating and maintenance problems of hydroelectric power stations most pressing at this time. Foremost among those questions which have developed into continuing studies are those relating to the growth of concrete, repair methods for concrete structures, preservative coatings for metal surfaces and the welding of waterwheel runners and draft-tube liners.

It is planned to continue round-table discussions on selected subjects. The advantage of this method of presentation has been proved highly successful for the purposes of the committee in the past. Arrangements will also be made for papers to be presented that will analyze the advances made by the industry in the design and construction of hydro stations.

The committee has tentatively scheduled two such meetings for the coming year. To obtain the benefit of closer contact with the substantial percentage of committee members in western states, the committee is at present considering arranging one of the meetings to be held this year in the West.

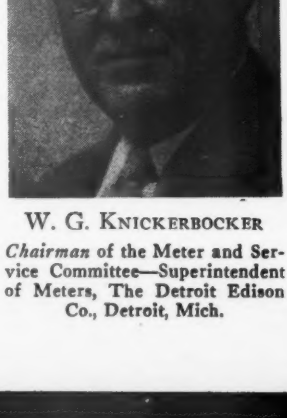
Meter and Service Committee

The Meter and Service Committee, under the Chairmanship of W. G. KNICKERBOCKER of the Detroit Edison Company, is planning to broaden the



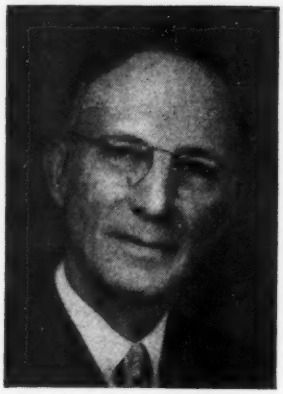
G. R. STRANDBERG

Chairman of the Hydraulic Power Committee—Chief Hydraulic Engineer, Stone & Webster Engineering Corp., Boston, Mass.



W. G. KNICKERBOCKER

Chairman of the Meter and Service Committee—Superintendent of Meters, The Detroit Edison Co., Detroit, Mich.



G. C. DANIELS

Chairman of the Prime Movers Committee — Chief Mechanical Engineer, The Commonwealth & Southern Corp., Jackson, Mich.

scope of the exchange of information on meters and metering equipment with member companies in this country and Canada. Part of this plan is to encourage the use of the committee as a "clearing house" for comments and suggestions on meter and service improvement sent in by member companies. Particularly important in this program are those subjects which may develop into a Specification or Recommended Practice.

The committee as it is now organized has 34 active members and 40 corresponding members who are widely distributed throughout the United States, including one sectional correspondent in Canada. The committee activities are divided among subcommittees, each studying a separate subject. At present there are 15 of these study committees.

Some of the subcommittees work on projects leading to the development of standard specifications of metering equipment and their installation. These subcommittees are more or less continuing in their approach to the problems. Others are engaged in collecting and disseminating information on their subjects, and are discharged at the completion of their work.

It is the constant objective of the committee to hold meetings of real worth, moving about the country so as to enlist the interest and support of metermen, with the end result that metering practices be improved, simplified and made as economical as possible.

Prime Movers Committee

The Prime Movers Committee has as its new Chairman this year, G. C. DANIELS of The Commonwealth and Southern Corporation. The committee is organized primarily to facilitate the flow of informational materials on the design, operation and maintenance of steam-electric generating stations among member companies to promote higher efficiency in the operation of steam plants.

Some 70 members of the committee are apportioned among nine subcommittees which deal with such varied phases of power generation as: Boiler Auxiliaries, Boilers and Combustion, Gas Turbines, Metallurgy and Piping, Oil and Gas Power, Power Station Chemistry, Power Station Data, Power Station Design and Turbines and Condensers.

Printed reports of the results of these subcommittee surveys are published each year recording periodically the progress of the industry in the art of power generation.

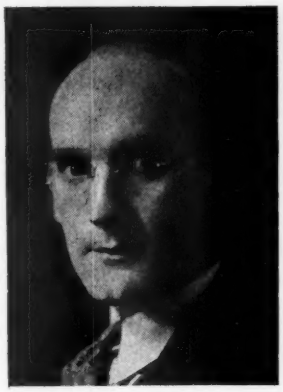
The Power Station Chemistry subcommittee, sponsored by the Prime Movers Committee, as an example, is a group of about 50 chemists in the power plant field who hold their meetings twice a year. The minutes of these meetings are published and distributed to all members of the Prime Movers Committee.

The Steam Contamination Research Project is also sponsored by the Prime Movers Committee for the EEI in cooperation with the AEIC and an advisory committee of the turbine and boiler manufacturers. The research program is being conducted at the Armour Research Foundation.

Members of the Committee also act as intermediaries in the interests of the Institute member companies with such national engineering committees as the A.S.T.M. or the A.S.M.E. They also cooperate on various occasions with manufacturers and others in the solution of serious operating problems.

Transmission and Distribution Committee

The Transmission and Distribution Committee, with T. J. BROSNAN of the Buffalo Niagara Electric Corporation as Chairman, has for its scope the study and discussion of all problems associated with the construction and operation of both overhead and underground transmission and distribution systems. Because of the diversified nature of the problems encountered, the work of this Committee has been subdivided into



T. J. BROSNAN

Chairman of the Transmission and Distribution Committee— Distribution Engineer, Buffalo Niagara Electric Corp., Buffalo, N. Y.

Standards and Specifications under the sponsorship of F. W. Nimmer of Ohio Edison Company; Overhead System under the sponsorship of H. E. Stites of Central Illinois Public Service Company; Underground System under the sponsorship of J. A. Pulsford of Public Service Electric and Gas Company and General Engineering under the sponsorship of L. G. Smith of Consolidated Gas Electric Light and Power of Baltimore.

The Committee plans to emphasize the study and discussion of methods for reducing the cost of construction and operation. The subjects of service improvement and system design for maximum flexibility will also receive considerable attention. This Committee has been asked to handle problems associated with utilization equipment. This assignment will be under the sponsorship of J. W. Anderson of the Philadelphia Electric Company. Another recent change has placed under the Committee all underground system equipment. Plans are being made for some extensive standardization work in this field.

Three two-day meetings have been scheduled. The first was held in Philadelphia in October, the second will be in St. Louis in mid-winter and the third will be in Chicago in the spring. An innovation that is being introduced experimentally is the subdivision of the Committee, for a portion of each meeting, into groups that will consider problems of common interest dealing with some specific phase of transmission and distribution design and operation. It is hoped that this will encourage a greater amount of informal discussion.

Accounting Committees Attack New Problems

COMMITTEES OF THE ACCOUNTING DIVISION

THE Accounting Division Committees are well into the administrative year's work, in a continuation of the unceasing attack on the ever-present accounting problems of the industry.

Besides "balancing the books" there are many aspects of the accounting field which demand application of constant research and a fresh outlook on the accountant's picture of the utility business. There is practically a day-to-day effort by the industry to keep accountants abreast of the changing aspects on federal and state regulation. It is the work of many committees and many men to provide interpretations of the latest regulatory practices.

Sharply rising operating and construction costs have added new responsibilities to this group and much of its activities are directed toward the accounting problems of a cycle of mounting prices. Another matter of concern to the accounting group, as well as to other segments of the industry, is that of human relations —including the creation of better understanding of management's problems and the seeking of more effective cooperation from employees and customers in combating misunderstanding of the electric industry.

The Accounting Division last year included a standing committee on Material and Supplies Accounting. This year a new independent committee on Purchasing and Stores has been authorized by the Institute's Directors, and most of the members of last year's committee on Materials and Supplies Accounting are now serving as members of the Purchasing and Stores Committee. The General Accounting Committee has in contemplation the organization of a subcommittee on Materials and Supplies Accounting to deal with the accounting as distinguished from the operating aspects of Material and Supplies Control but at this time the chairman and personnel of such a subcommittee have not been selected nor have any specific projects been designated for development by it.

Chairmen and members of all committees and subcommittees have started the year's work with enthusiasm and the prospects are for another year of common achievement out of which all utility accountants will derive something of benefit and many will obtain assistance of great and immediate value on their own special problems.

H. B. HARDWICK

Chairman of the Accounting Division General Committee—Controller, Consumers Power Co., Jackson, Mich.

The committees of the Accounting Division for this year, as for a number of years in the past, will coordinate their work with that of the Accounting Section of the American Gas Association. It sometimes seems to be a little difficult for engineers, operating managers, and salesmen—particularly the latter—to understand how such close cooperation is desirable or possible between two industries whose technical problems are largely dissimilar and which in many respects are competitors.

However, as far as accounting is concerned the problems of the two industries are almost identical and it would be a foolish waste of effort not to attack them jointly; and while there is always a certain amount of good natured banter at joint meetings among representatives of the two industries, the actual work is carried on in a spirit of complete cooperation. In the following outline of the Institute committee program for the current administrative year it should be understood, therefore, that where it is not otherwise indicated, the work will be undertaken as a cooperative enterprise in which representatives of both industries will or may participate.

Accounting Division General Committee

The Accounting Division General Committee, which coordinates and controls the work of all the other committees of the Division, is this year under the chairmanship of H. B. HARDWICK, Consumers Power Company, Jackson, Mich. Allen Mitchell, Philadelphia Electric Company, is vice chairman. This committee, in addition to exercising general supervision over the work of the Division, also holds meetings from time to time to deal with problems of general interest to industry accountants which are either of such nature that they cannot be handled effectively by the standing functional committees of the Division, or need to be discussed informally before any decision is made on referring them to one or another of these committees for more intensive study. The Accounting Division General Committee may also review reports of standing committees or subcommittees before action or release.

In addition to the foregoing functions, the Accounting Division General Committee on occasion authorizes the appointment of special subcommittees to investigate and report on topics of broad interest to utility accountants which are not assignable to any of the functional committees. This year there will be at least two such subcommittees. One of these is a continuation of last year's subcommittee on Standard Arrangement of Provisions in Mortgage Indentures under the chairmanship of R. N. Benjamin, Stone & Webster Service Corporation. Another special subcommittee will be one on Methods of Determining a Fair Rate of Return, under the chairmanship of H. P. Taylor, Wisconsin Public Service Corporation, last year's chairman of the Accounting Division General Committee.

Two other special subcommittees have been discussed but not yet authorized. One would endeavor to explore the effect on accounting records and financial statements of a permanent and significant change in the general price level. The other would study the relative efficiency of public and private utility enterprises as expressed in their financial results.

H. H. SCAFF

Chairman of the Committee on Application of Accounting Principles—Vice President, Ebasco Services Inc., New York, N. Y.

The Committee on Application of Accounting Principles

The Committee on Application of Accounting Principles will be continued with H. H. SCAFF, Ebasco Services Inc. as its Chairman and W. H. Swinney, West Penn Power Company as vice chairman. It acts as an intermediary between industry accountants and members of the public accounting profession, as well as accountants of the staff of regulatory agencies, in the application of accounting principles to the special problems of public utilities subject to regulation.

Customer Activities Committee

The Customer Activities Committee, with GLENN RAY of the Indianapolis Power and Light Company as Chairman, has been considerably enlarged in order to cope more effectively with the great variety of problems coming within the sphere of customer accounting departments. It will carry on its work this year through four major subcommittees corresponding to four standing committees of the American Gas Association's Accounting Section. Each of these subcommittees will in turn have several projects to be dealt with by small project committees or individual assignments. The program thus far agreed upon is summarized below:

Customer Relations—Chairman, J. C. FARIS, Union Electric Company of Missouri.

1. Further detailed study of accounting forms from a customer relations viewpoint.
2. Techniques of customer opinion sampling.
3. Review of experiences with Saturday closings of business offices.
4. Review of informational booklets for new customers.
5. Statistical determination of suitability of business office locations.

Customer Collections — Chairman, G. A. WILSON, Public Service Electric & Gas Co., Newark, N. J.

1. Review of collection practices from the standpoint of their cost.
2. The influence of adequate paystation facilities on collection results and costs.
3. Current developments in collection practices.
4. Study of deposit coverage on residential accounts, from the collection standpoint.

Customer Accounting — Chairman, R. G. SCHNEIDER, Virginia Electric and Power Co.

1. Administration of fuel adjustment provisions in electric and gas rates.
2. Recent development in tabulating card accounting and billing.
3. Meter reading instruction manuals.
4. Publication of accounting equipment and methods developments.
5. Study of accounting office production controls and costs.
6. Review of suggested definitions of customers and classifications of service.

Accounting Employee Relations—Chairman, J. E. KING, Consolidated Edison Company of New York.

1. Development and application of periodic objective rating plans for office personnel.

The subcommittee on Accounting Employee Relations, while established primarily within the Customer Activities group because by far the largest number of accounting office employees are engaged on some phase of customer accounting, will also have one or more representatives from the General Accounting Committee and will coordinate its program with that of the industry's Committee on Industrial Relations and the Personnel Committee of the American Gas Association.

GLENN RAY

Chairman of the Customer Activities Committee — Customers Service Department, Indianapolis Power & Light Co., Indianapolis, Ind.

A. H. KUHN

Chairman of the Depreciation Accounting Committee — Manager, Property and Insurance Division, Public Utility Engineering & Service Corp., Chicago, Ill.

Depreciation Accounting Committee

The Depreciation Accounting Committee, which has no counterpart in the American Gas Association Accounting Section, is this year headed by A. H. KUHN, Public Utility Engineering and Service Corporation, Chicago, Ill., and Fred Eckstein, New Orleans Public Service Inc., vice chairman. It will continue its work on a long term program of which the outstanding features will be the completion of a revised-to-date edition of the report prepared in 1942 by its predecessor committee in collaboration with the then existing Depreciation Accounting Committee of the American Gas Association on "Methods for Estimating Service Lives of Utility Properties." The committee will also give special attention to the effect of mortality dispersion in mass property (poles, wires, meters, line transformers, etc.) on annual depreciation charges and the amount of an adequate depreciation reserve.

General Accounting Committee

The General Accounting Committee,

O. K. BOYD

Chairman of the General Accounting Committee — Assistant to the Secretary, Consolidated Gas Electric Light & Power Co., Baltimore, Md.

Chairman O. K. BOYD, Consolidated Gas Electric Light and Power Company of Baltimore, vice chairman H. W. Boozer, Georgia Power Company, works principally through its subcommittees. The subcommittees appointed for the current year with a brief description of their proposed activities are as follows:

1. *Simplification of Financial Statements.* A study of what can be done to make statements based on accounting records more intelligible to investors, customers, employees, and the general public.
2. *Internal Auditing.* This committee will give special attention to the relations between the internal auditor and the independent auditor.
3. *Machine Applications for General Accounting.* This year's work will deal principally with purchasing and stores and accounts payable records.
4. *Functional or Responsibility Accounting.* This committee's work will be a continuation of comparative studies of the extent to which this type of accounting is or can be used by electric and gas utilities, including particularly the use of tabulating machine punched cards as compared to manual records for the detailed record keeping of responsibility accounting.
5. *Licensed Projects Accounting.* This committee is for electric companies only. Its work is expected to deal largely with the Federal Power Commission's rules governing the determination of net investment in a licensed project, but other topics may be developed during the year.
6. *Preservation and Destruction of Records.* The committee's efforts will be devoted to (a) an attempt to persuade regulatory agencies that some further liberalization of retention periods should be permitted, especially with respect to supporting details of plant costs; and (b) to an exploration of the conditions under which microfilming can be employed, with a discussion of its advantages and limitations.
7. *Revisions in Operating Expense Accounts.* This subcommittee is a continuation of one originally appointed in the fall of 1945 to cooperate and advise with the Wisconsin Utilities Association to consider proposals from the staff of the Wisconsin Public Service Commission for revision of the NARUC-FPC Uniform System of Accounts' classification of operating expenses. The proposed revision would reduce the number of accounts by about one-third and clarify the text. Discussion of the details of such proposed revision is still in progress.

Plant Accounting and Records Committee

The Plant Accounting and Records Committee, Chairman L. C. PURSELL, Pennsylvania Power and Light Company; vice chairman, J. A. Ryan, Consolidated Edison Company of New York, has agreed upon five subjects for study and report during the year. These are briefly described below:

1. Use of Standard Costs in Pricing Units of Property.

L. C. PURSELL

Chairman of the Plant Accounting Committee—2nd Vice President, Pennsylvania Power & Light Co., Allentown, Pa.

H. S. HOWARD

Chairman of the Taxation Committee — Assistant Controller, Niagara Hudson Power Corp., Syracuse, N. Y.

2. Reconciliation of Office Quantity Records With Field Inventory. How often should verification be made?
3. Unit Costs. To what extent are companies grouping items into one unit cost and grouping components of costs for property record purposes?
4. Accounting for Major Construction Projects. This covers particularly the type of project which is often done or in the past has been done by independent contractors. The accounting work in connection with such projects covers distribution of charges to prescribed primary accounts, commitment records, individual job accounting, progress reports, and any other records that will be helpful in the control of construction costs. The discussion will emphasize the problem of accounting personnel to be attached to, or to cooperate with, the field engineering and construction forces.
5. Unitizing General Equipment. This study will deal with the classification by units and the use of standard costs for such categories of property as office furniture, tools, automobiles, and possibly other kinds of property made up of a relatively large number of similar units capable of service for several departments or functions.

Taxation Accounting Committee

The Taxation Accounting Committee has for this year's Chairman, H. S. HOWARD, Niagara Hudson Power Cor-

(*Continued on page* 428)

American Faith in A Dynamic Economy

By Charles E. Wilson
President, General Electric Company

An address presented at the dedication ceremonies of the Fred M. Locke Ceramic Laboratory, of the Locke Insulator Corp., Baltimore, Maryland, September 30, 1947.

PROBABLY enough of you have been professionally connected with, or exposed to, radio to know what a "gimmick" is, but for those who have not, let me display my new-found knowledge. Briefly, a gimmick is a device, or an angle, which is novel enough to launch a program, and durable enough to keep it going in the face of sponsor interference, public apathy, creative rigor mortis, and all of the other perils to which broadcasting is exposed. In another sense, a gimmick is a handy instrument with which a burglar successfully opens a ground-floor window. It is useful, it should be effective, but it may not have much to do with what follows. And this is probably one of the longest introductions you have ever experienced to explain an opening remark—but I have a gimmick with which I shall now proceed to open the window.

There is this radio news report from early last week: "In Boston the CIO Electrical Workers' Union has voted to demand (note *demand*, from the language of the ultimatum) that all employers having contracts with the union join in boycotting the National Labor Relations Board under the Taft-Hartley law. The demand was contained in a resolution adopted unanimously by 1000 delegates to the EWU's 12th annual convention. Among the corporations having contracts with the union are General Electric and Westinghouse."

Threats Against Law

In an era of endlessly disturbing days I think this is a fairly typical selection. There was a wide field to choose from, and I might have selected the high cost of food, Vishinsky's speech of hate before the United Nations assembly, the current estimate that the United States must supply $21 billion to Europe under the Marshall plan, or still another item from the union's convention—when they officially voted down the resolution to eliminate communist influence from the union. Even if you were not connected with one of the corporations which, as noted in the news broadcast, were being summarily told to boycott the National Labor Relations Board, I think you might find it disturbing to find an official convention of American labor, and the third largest of CIO Unions, going on the record in open defiance of the law of the land as enacted by the Congress in its representative and constitutional capacity, and then following that up by ordering the contracting employer to follow suit, presumably on pain of some dire consequences. I should think any of us, regardless of our opinions or our sympathies, even if we happened to be the president of the CIO or the AFL themselves, would find that day a little darker on which the law of the United States was deliberately rejected.

The Gimmick

This was my gimmick, for a reason. The actions of various groups and individuals throughout the world, from Jugoslavia to Lake Success, by way of Washington, Moscow, and Brooklyn, have been making pretty bad reading. We should be ostriches indeed to pretend that it was otherwise, or to evade by shutting our eyes to the black shadows cast across the future of peace and the future of America by events in Palestine, in India, in Hungary, in China, in Korea, in Rome and Paris and London. Certainly this generation at least is in for a lot of trouble and a great deal of expense, and because it is news in any language, our newspapers cannot be blamed for putting it right where any top news story belongs—on page one.

But that is not, I submit, the whole story. Ordinary people, who do not happen to be presidents or foreign ministers or generals or movie stars, but who simply go along running banks and factories and grocery stores and punch presses, have a tendency to let page one get them down. They forget that they live their own lives mostly in the back pages of the paper, and that what happens in the back pages, back among the movies and the stock market and the department store advertising and the club news, is probably going to have a great deal more influence on what some future Gibbon writes, when he sets down his study of history, than anything that rates the scare heads today. As long as good news is too dull or too familiar to make a fuss about, we are still preserving the balance of our world on the credit side.

In the few minutes ahead I would like to examine with you, in a very calm, small way, some of the good things in life. Tomorrow we can go back to worrying about the others—and if we don't then worry quite so much, perhaps the time will have been well spent. Let us restore our sense of balance with a few dull figures which for all their dullness actually represent the real strength of the American economic system in its true light, and which, for that reason, supply us with a much more reliable crystal ball for calling tomorrow's events than some of the highly polished jobs that are currently being twirled in the capitals of the world—including our own. If we can take a look at our family album and draw from that examination a plan of action for tomorrow that will offer us more than fear, despair, hate, and war, then I don't think that we are being fools, charlatans, or pollyannas.

Counting Bathtubs and Telephones

Probably it has been too often our custom, in attempting a searching one-minute inventory of the American System, to fall back on counting bath tubs and telephones. That served its purpose when we were arguing with people who knew about bath tubs and telephones, and who appreciated the industrial and distributive background against which we produced these indices of progress in such numbers. But today we must dig a little deeper. We feel that our system, and our ability to lead the world some distance out of its troubles, is being kicked around by great masses of people who look upon a bath tub and a telephone as a sign of political or ideological immaturity. They see the device itself as a sort of capitalistic insignia, a sign of selfishness and softness and an insult to the downtrodden masses, and they completely miss the point that

these are only end products of a dynamic economy which can help them out of their misery if they will only let it try.

What does a more searching inventory of our system reveal? Three things: first, the truly dynamic character of the American economy; second, the projection of that character into the future, because nothing in sight so far can stop it; third, a social growth, or coming-of-age, that even we ourselves have not appreciated.

Evidence of the dynamic character of the American economy is found when we consider the rapid rise of industrial research, the increase in national output, the increase in worker output, and the growth of capital investment in the worker, to name the first things that come to mind.

The Dynamics of Industrial Research

In 1940, before we were fairly under the driving and expanding stimulus of war, the amount of formal industrial research being done in the United States had already increased 10 times over the amount that was done in 1920. In the General Electric Company we have been in a position to see and record this growth, because we established our own research laboratory just after the turn of the century. At first we were acutely aware of the difficulty of convincing scientists that there was an honorable future for them in such a venture. They were at first skeptical of our motives, and then of our good sense. Today the fruits of that joint adventure are so overwhelming that we need not pause to recount them. If it were not for industrial research we would not be here —literally. I know of nothing so characteristic of the pattern of American economic growth, or so compelling in its results—on competition, on progress, on prosperity, on our whole national life—as this one factor.

Another piece of evidence is found in the tremendous increase in our national output. It is the one great inescapable fact that no fanatic can argue around, no matter how passionately or how deviously he may try. It needs no defense. American productivity has been the deciding factor in two world wars. It has built the fabulous structure of the Western World. It is our tower of strength which even we ourselves underestimate, and I doubt very much if it will ever be torn down from a soapbox. Europe inches along at from 35 to 40 per cent of its pre-war industrial output; the United States is operating today at about 185 per cent of its pre-war industrial output. It is quite true that in the relation which one of these figures bears to the other lies our paramount problem of economic rehabilitation for the world, and that is a long subject by itself, but the figures themselves are most eloquent evidence of the dynamic character of our economy. We would be unrealistic indeed, if we could not find some reassurance in them.

Before leaving this matter of national output there are one or two comments that are pertinent. I believe we have tended to underestimate the strength of some of the postwar inflationary forces; that is, the reasons which underlie our inflation seem to have been more solid than we anticipated. We did not have the unemployment, forecast in certain quarters, because of a tremendous burst of public buying, which has held on longer than was expected. If this were a mere boom-and-bust cycle, the decline in orders—when it did come—would have been followed by cuts in production, employment, and buying power. But this has not happened, and the demand for goods has been sustained at such a level that it was possible to adjust unbalanced inventory positions without creating a recession in business activity.

Furthermore, despite a great deal of loose talk to the contrary, most of the price increases about which I have had any knowledge have been made reluctantly, with a full awareness of the possible effect on business, and they were made only because of the pressure of rising labor and material costs. It is difficult not to reach the conclusion, in the face of continued buying at high prices that these prices are much more strongly based, and the whole price structure less vulnerable, than was the case in 1920.

Inflation with Full Employment

Finally, we have concentrated our thinking so much on the idea that we have been building up inventory and filling needs deferred by war that we have overlooked what is now almost the main factor in our market—the large current demand caused by full employment at high wages. In July of this year there were a third more civilians employed than in 1939, and the real income of the average worker, allowing for the increase in the cost of living, was 27 per cent larger.

To summarize, then, in this matter of national output, our inflation may not be as artificial as it looks, our price structure seems to be rather strongly based, and demand for goods may well remain at a high level.

As for the increase in worker output, it is an established fact that before the war it averaged 3 per cent annually. That fact alone testifies to the dynamic character of our economy. There is no foreseeable saturation point in this figure since it is not entirely a matter of individual worker efficiency. It is a by-product of better methods, better machines, and better working conditions—one of the dependable ascending curves in our industrial experience. Increased output per worker accounts for greater national output, and acts as an offset to increased material and labor costs.

More Tools at the Expense of Capital Income

Finally in this inventory of what has kept us on the move, it is an interesting but entirely logical fact—considering what has gone before—that in the 60 years between 1880 and 1940 the amount of capital that industry invested in its worker has increased three fold. Capital's share of the income derived from this partnership has declined steadily, however, which is also as it should be. The only interpretation that applies here, in simple language, is that risk capital has continually been willing to support American industry in increasing amounts; that the productive efficiency of the worker has been steadily increased through better tools and constant research; that greater production has resulted and that the worker has received a continuously larger share of the profits. This is the recipe from which we have concocted a dynamic economy.

Having revealed the character of our economy with what I believe to be substantial evidence, it should not require too much straining on our part to extend the curves into the future and to project a reasonable national course of action. It would be comforting, in the face of the daily attacks upon our system, and in the face of the predictions that swell from within the country as well as from without that time is about to blow the whistle on the institution of private enterprise, to feel that we have only to stop our ears to the clamor and fight it out along the same old lines. Unfortunately this is not quite true. Like any fighter of experience we must

do a certain amount of rolling with the punches and adapt our program of attack to prevailing conditions.

But this is nothing new. The American capitalistic system has never been blind nor foolhardy nor reactionary in the long run or it would have fallen long ago. Its adaptability on defense has always matched its boldness on attack. We are possessed of a working, practical economic philosophy, proved by time and results. We are opposed now, and in the past we have been opposed by, economic and social theorists who—to be kind—have never won a major skirmish. Let us not ignore our opponents, or take them lightly, but also let us not lose confidence in our own methods.

Professor Sumner Slichter, Lamont Professor at Harvard, has recently called attention to something which should not be overlooked. He notes that the revolt against Laissez-Faire and the rise of economic policy taken together constitute one of the distinctive trends in 20th century civilization. In other words, as we have expanded, as our economy has grown, as we became more of an influence abroad and at home in shaping the fortunes and destinies of people, we have had to make economic decisions and adopt conscious policies that were unknown to the early industrialist who was uninhibited by broad social considerations. This conscious economic policy-making has accomplished much good, in the way of labor legislation, monopoly regulation, control of interstate commerce, and so on, but Professor Slichter points out that the chance for blunders and unintended results is also great. We must make sure, in the United States today, that we pursue *policies which stimulate expansion of production,* rather than limit or strangle it. We must continually keep our eye on that ball. As an example, much American economic thinking of today is still unduly influenced by the depression of the 30's, which caused temporary conditions to be regarded as indicating permanent trends, and resulted in the questionable overemphasis on security at the expense of opportunity.

The dynamic character of our economy will be continued into the future by the plentiful supply of new materials, methods, and processes which have sprung seemingly from war experience, but actually were gathering momentum years before in the active crucibles of industrial research and in the tireless experimentation of specialists. The most spectacular of these, of course, is atomic energy. Startling progress in the mediums of transportation and communication, which are themselves logical results of a competitive economy, will be the instruments of extending the scope of that economy, as they strike the shackles from undeveloped areas and create new services and businesses.

It is no accident that your country is both the economic and the scientific center of the modern world, for the two go hand in hand. The very increase in the number of scientists in America is a guarantee of increased competition. We forever underestimate our capacity to produce new enterprises. For over 70 years the number of physicists, engineers, chemists, and metallurgists has increased from 10 to 14 times as fast as has the total number of gainfully employed persons, due primarily to the rise of industrial research. Research creates competition, and as Professor Slichter also pointed out, in America, because of the "Unplanned" way we do business, we have a larger number of business enterprises, keener competition, and increasing expenditures for research. We have 10 million centers of innovation—6 million in agriculture and 4 million outside of agriculture—where experiments are constantly being tried without having first to obtain the authority of the state or other controlling body. No regimented economy can compete with such a set-up. By its very nature its must fall behind of its own weight and inflexibility. These are some of the salient considerations for us to ponder, and from which we can take courage, as we face the future.

In all of this, as we noted in the beginning, there are also evidences of our coming of age, of our economic maturity. Often we have so taken them for granted that we were unaware of them. Today we are conscious of our leadership and our responsibility in the politico-economic world. In fact it has been thrust upon us. And we have adjusted ourselves internally over the years: We have better state and local government and a higher grade of public service at the local level; we have a more marked cooperation between industry and government agencies, for all of our disputes; we are striving for better housing and increased educational facilities; undoubtedly we have better living and working conditions; we have greater intellectual freedom, and we are stronger in the enjoyment and appreciation of civil rights. Even our troublous labor legislation itself, as represented by the Wagner Act and the Taft-Hartley Act, has moved us slowly toward industrial citizenship. We are making progress, even if we sometimes lose that fact in the grinding of the gears and the howls of the reluctant and the recalcitrant. I think that the responsible leaders of labor are aware that even though small groups may be able, now and then, to raise the standard of living by sheer bargaining power, still for labor as a whole, the real advance depends on the rise in output per man-hour. We must keep ever uppermost in our minds the fact that today employees get some 60 per cent of the national income, and the fact that 3 out of every 4 gainful workers *are* employees. Thus has our economy changed the national character of our population.

These are some of the things we draw from a sober inventory of the American way of life—some of the good things in our life, some of the steady and important things, from which we can make up our counsel and draw our determination to press ahead, no matter how stormy and unpromising the outlook may be at the moment. These are the small but mighty triumphs that are recorded in the back pages of the paper, every day, which you can use to counteract the forbidding headlines of Page One. Frankly I used my gimmick, of an alarming situation picked at random, to open a window—but from the inside, not the outside, because I thought it might be more profitable, and certainly more pleasant, if we passed by the hue and cry of our spectacular troubles for the moment and drank in a little fresh air from the great, magnificent, and satisfying panorama of America as she really is.

AEIC and EEI Meter and Service Committees Plan February Meeting

THE Meter and Service Committee of the Edison Electric Institute and the Committee on Metering and Service Methods of the AEIC have both scheduled meetings at the Biltmore Hotel in Oklahoma City next February 9, 10 and 11, W. G. Knickerbocker, Chairman of the EEI Committee has announced. Part of the three-day session will be devoted to joint meetings.

Several important subjects relating to electric meters and meter servicing will be discussed at the meetings, according to Mr. Knickerbocker, and a large attendance is anticipated.

New Research Lab to Test High Voltage Insulators Dedicated by Locke Insulator Corp.

THE Locke Insulator Corp. dedicated on September 30 two research laboratories at its Baltimore plant. One, the new Fred M. Locke Ceramic Laboratory, will be devoted to research in the broad field of industrial ceramics. The other, an existing high voltage laboratory, named for its builder, Frank H. Reagan, former president of Locke, will engage in high voltage research in electrical insulation. Work at the new Ceramic Research Laboratory, according to R. G. Bellezza, president of Locke, will be along three main lines: development of closer control over materials and processes, evolution of new uses for ceramic materials, and the development of new ceramic materials and processes.

The Fred M. Locke Research Center consists of: (1) A research laboratory for applied research on ceramic materials, (2) an experimental laboratory where research developments can be tried out on full scale, before release to general production, and (3) a material control laboratory to assure maintenance of high standards of quality in materials and processes.

In the existing high-voltage laboratory, apparatus is provided for production of impulse voltages of nearly 2,000,000 v and commercial frequency voltages of over 1,000,000 v as well as machines for testing mechanical characteristics of both insulators and hardware.

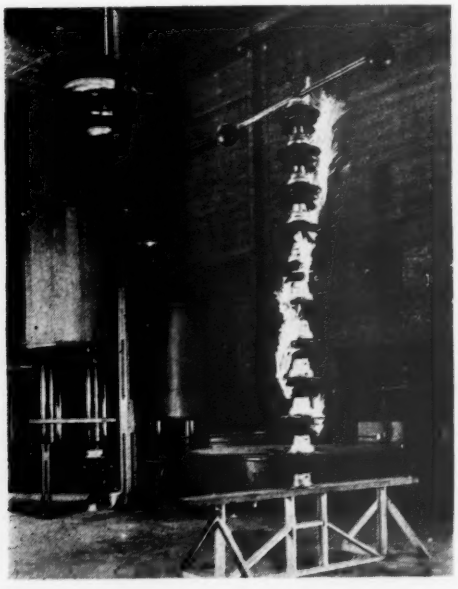
At the dedication of the laboratories, brief ceremonies preceded inspection of the plant and research facilities by upwards of 150 guests from all branches of the electrical industry.

Dedication of the laboratories was by Dr. C. G. Suits, vice president of General Electric Co. and director of the GE Research Laboratory. Dr. Suits pointed to several specific fields that would benefit from planned research.

In ceramics new dielectric materials for condensers possessing special properties are needed, he indicated. Tetinates of barium strontium show promise, Suits said, of giving dielectric constants a hundred times higher than those common today. Development of the GE Research Laboratory may afford a new method of bonding ceramics to metal in electronic tube construction. And, where mechanical parts are subjected to very high temperatures, ceramics has another role, he pointed out. Coating of metal turbine buckets with ceramics has intriguing possibilities, he asserted.

Acceptance of the new ceramic laboratories was made for the electrical industry by Ernest R. Acker, vice-president of the Edison Electric Institute and president of Central Hudson Gas & Electric Corp. "As an industry," he pointed out, "we foresee the need for transmission lines with increased capacities and higher transmission voltages. Such new lines will inevitably create new insulator problems. Increased insulator strength will be required as an entirely new concept of the supporting insulation, for these lines may very likely be developed requiring ceramic developments far beyond present possibilities," Acker said. Much remains to be done in the joining of porcelain to metal parts to provide completely satisfactory bonds between these materials under all conditions. Present-day problems include the need for more accurate threads on pin-type insulators and the elimination of insulator troubles under abnormal weather conditions in some areas.

Also participating in the ceremonies were several officials of the General Electric Co., Locke's parent organization, among them President C. E. Wilson. and Vice Presidents Ralph Cordiner and Harry A. Winne.



A Stack of Switch Insulators Flashed Over at About 1,000,000 V During Tests in the Frank H. Reagan Hi-Voltage Laboratory.

A Section of the Fred M. Locke Ceramic Research Laboratory in the Plant of the Locke Insulator Corp. at Baltimore Recently Dedicated to the Study of Ceramic Materials and Processes.

Generator Ratings and Load Carrying Capabilities of Generating Plants and Systems

By J. H. Foote

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An address presented before the Electrical Equipment Committee of the EEI at Philadelphia, Pa., October 7, 1947

THE determination of the proper kw rating of a generator intended for the typical American electricity supply system is of interest to all who are concerned with the planning, operation and management of electric utilities.

Historically, there has been wide variation in kw rating practice. On the one hand, generators were rated conservatively at a nominal figure admittedly below the actual load carrying ability. Again, generators have been skimpily designed in terms of their rating so that they would carry scarcely the load expected of them. Recently a joint national committee has done excellent service in standardizing a series of ratings of steam-electric generators. This has resulted in a fairly consistent series of ratings covering a range of sizes at 3,600 rpm.

It seems to be of interest to ascertain the compatibility of the kw ratings and actual load carrying capabilities of the prime mover, its associated electric generator, and the system load which it will satisfy.

Generator Capability

The amount of electrical load which the generators on an electricity supply system can be expected to carry at the time of peak should be the measure of the capability of those generators. To determine such generator capability, it is necessary to take into account a number of pertinent factors and to bring them to bear upon the problem of a proper rating in a manner which evaluates them adequately, and of course a prime consideration relates to the determination of the system load on the premise that the true capability of a generator is in fact the amount of system load which it will satisfy.

A variety of methods of measuring and evaluating system load in terms of peak demand has been employed in times past. On systems of small geographic extent and with few large stations, it has been feasible to measure system demand in terms of momentary kw requirements as obtained from indicating instruments or totalizing metering equipment, However, the more typical American situation involves generating stations dispersed over areas so large that determination of simultaneous load from indicating instruments becomes impractical and the installation of system demand totalizing equipment expensive and undesirable. Therefore the practice has become increasingly prevalent if not practically universal of determining and expressing system load demands in terms of the average kilowatthours supplied to the load by the generators in a clock hour, this procedure involving the reading either visually or automatically of net load kwhr furnished by power supply sources in the successive 60 minutes of each hour of the clock through the day and night.

Load Measuring on Interconnected Systems

The advantages of this method of determining load have been recognized by most if not all interconnected systems and by regulatory bodies, notably the Federal Power Commission, whose report forms call for expression of load demands in terms of integrated kwhr per hour.

Not only is the measurement of load in terms of average kwhr per clock hour a universally applicable method widely recognized, but fortunately the characteristics of the typical system load is compatible with the thermal ability of an electric generator to carry that load. In fact, the average kw load over the period of an hour is much superior to the momentary load as a measure of the service required of a generator or of its ability to serve a load.

At the same time, the prime mover driving the generator must be able to carry not only this average load but also the momentary swings of load which are in excess of this average. Such momentary swings may exceed the hourly average by from 2 to 10 per cent, depending upon the characteristics of the system and its size. Perhaps 3 or 4 per cent would constitute the mode for typical interconnected systems.

In the case of a small system serving large fluctuating loads, the momentary peaks may at times exceed the hourly average by amounts approaching the value of 10 per cent mentioned above. In geographically compact metropolitan areas serving large loads, the maximum load within a clock hour may exceed the average by a considerable amount when, for instance, a cloud bank darkens the area for but a portion of the clock hour period. A system serving a large load over a wide area will probably have the least variation within the hour because of freedom both from significant darkening and from the effect of large fluctuating loads, by benefiting from the effects of diversity among the many areas served.

The prime movers and generators which are to supply load, measured as outlined above, must be able not only to supply the load, including momentary kw swings, but at the same time to carry the auxiliary power required by the operation of the generating plants themselves.

Load Conditions Under Combined Systems

Further, the combined system of generating plants must be prepared to supply system load under the usual overall operating conditions existing at times of peak. It must be assumed, for example, that some machines will have been recently overhauled and are probably in the pink of condition while others are approaching a period for scheduled maintenance and possibly operating a little short of their best performance. Variations in fuel and condensing water from time to time also have their effects.

Again, on a combined system the duty of frequency regulation must be shared in some manner by various machines; and during the life of any given

generator, it can be expected to run the gamut of position in the load despatcher's schedule: from favored pet at steady base load when new to work horse swinging into short-time peak periods when maturity has been reached.

It is apparent, therefore, that the kw rating of a generator should take into account a number of factors, including the characteristics of the load, of the generating plants, and of the system—typically of the wide spread type of interconnected system common in this country.

It is suggested that the most useful, the most significant, and the most satisfying rating for a generator in the combined view of engineers, operators and management should be that amount of the system's peak load which the generator can be expected to carry when called upon to do so during the major portion of its useful life and under the expected conditions of operation throughout the system.

Such a rating should have a name. Perhaps a suitable designation would be "Dependable Net Capability." Definitions of this rating and of "System Load" which this amount of generation would satisfy might be formulated as follows:

System Load shall be the integrated kwhr appearing at the power supply sources in any one clock hour and measured at those sources. It shall be the net load appearing thereat, not including generating station auxiliary power requirements.

Dependable Net Capability of a generator, generating plant, power source or system at any particular period shall be the System Load which can be supplied thereby on the basis of the operating conditions expected to exist on the system at that time.

Such a capability rating of a generator would, however, be incomplete without the designation of other values designed to insure that capability is provided adequate to take into account the various factors outlined heretofore. Additional capability therefore must be provided in the design to supply the needs of the following.

1. Operating Condition Factor

First is the operating condition factor, which recognizes that at any one time all plants on the system can not be expected to be able to carry simultaneously the maximum loads which often they can supply individually. This factor may derive from any number of circumstances of weather, condition of maintenance, quality of fuel, etc. It should not include outages of generators for maintenance, which constitutes an entirely separate consideration. Capability ratings of generators must assume that they are operating and supplying load.

If a name for the capability of an individual plant operating as part of a system but without benefit of this average operating condition factor be desired, it and its definition might be formulated as follows:

The Maximum Net Loadability of a generator, generating plant, or power source constituting a part of an interconnected system shall be the maximum System Load in net kwhr per clock hour which it can be expected to supply under the operating conditions normally to be expected to exist during that hour.

Obviously the sum of the Maximum Net Loadabilities of the power sources will exceed the Net Dependable Capability by reason of the operating condition factor described herein. At the same time, requirements of the load for regulation and for the momentary, or other amounts of load variation expected to prevail within the hour have been provided for. Maximum Net Loadability contemplates the proper supplying of System Load under good plant operating conditions.

2. Hourly Variation of Spread Load

The second consideration is the variation of the load within the hour, discussed in earlier paragraphs, the duty for which, in terms of rating, has been assumed to be spread among all the power sources.

The prime movers driving the generators must be capable of maintaining frequency even under the imposition of momentary loads to be expected and the ability to do so may provide the basis for a rating. However, it must be a rating restricted in scope of application with respect to the supplying of System Load and in the probability of its being of significance in terms of System Load. It should be useful in terms of ratings of some of the plant and system facilities.

A possible name and definition for this rating might be as follows:

The *Maximum Net Rating* of a generator or generating plant shall be the maximum net steady output in kwhr per hour which under reasonable operating conditions can be supplied to the System Load for a period of at least two hours; other power sources supplying any required variations in load within the period assumed.

3. Power Requirements for Station Auxiliaries

Then there are the requirements of the generating plants for power to operate station auxiliaries, which may be supplied from a variety of sources but not considered a part of System Load.

If the prime mover or the generator supplies this auxiliary power, it is necessary to name and define the rating of the generator (or at least of the prime mover) in terms of its ability to carry this as well as the other loads imposed upon it. The sizes of steam, water and electrical pipes, conductors and equipment will then usually be based upon this rating. If special generators supply the auxiliary load and are operated in parallel with the main machines, they may be accounted a part of plant generation on their own account.

A suitable name and definition might be:

The *Maximum Gross Rating* of a generator or generating plant shall be the maximum gross steady output in kwhr per hour which it can produce under reasonable operating conditions for a period of at least 2 hours.

4. Variation in Prime Mover Capability

There is one more factor of interest. It is the leeway provided in the design and execution of the machines by the manufacturers. This leeway may be favorable or otherwise. It normally should be positive, with excess capacity, but on occasion it may be negative.

In the final determination of the dependable capability of the generator as a power source for the satisfying of System Load, the knowledge of what the generator will do under proof conditions is of genuine value. It constitutes the cornerstone of reference upon which the other ratings can be based.

A name and definition for this reference rating might be as follows:

The *Maximum Demonstrated Gross Output* of a generator shall be the kw produced while demonstrating its maximum performance under rated conditions when in first class operating condition.

Summing Up the Ratings for a Typical System

How do these various ratings fit together? What is their practical sig-

TABLE I—TYPICAL SCHEDULE OF GENERATING STATION RATINGS AT TIME OF PEAK

Plant and Number of Unit	Maximum Demonstrated Gross Output Mw	Maximum Gross Rating Mwh/Hr	Maximum Net Rating Mwh/Hr	Maximum Net Loadability Mwh/Hr	Dependable Net Capability Mwh/Hr	Name Plate Rating Mw
	Individual Units	Individual Plants	Individual Plants	Individual Plants	Combined System	Individual Units
Old Plant [a]						
1	23	(22)	—	—	20	20
2	25	(24)	—	—	21	20
3	49	(46)	—	—	41	35
4	45	(43)	—	—	38	35
	(142)	135	128	124	120	
Modern Plant [b]						
1	46	(44)	—	—	37	35
2	46	(44)	—	—	37	35
3	68	(65)	—	—	56	50
	(160)	153	145	140	130	
New Plant [c]						
1	72	(69)	—	—	60	60
2	72	(69)	—	—	60	60
3	72	(69)	—	—	60	60
	(216)	207	198	189	180	
Totals	—	—	(471)	453	430	

(a) Old Plant—1923-1930 design with low-pressure, stoker-fired boilers and 1800-rpm generators.

(b) Modern Plant—1935-1940 design with high-pressure, pulverized-fuel-fired boilers, 3600-rpm generators.

(c) New Plant—1945-1947 design with high-pressure boilers and 3600-rpm generators.

Note: Figures in brackets do not constitute ratings on total abilities and are only for reference purposes.

nificance for a typical system? These questions may best be answered by inspection of a tabulation of typical values as they might appear on a typical interconnected system.

Table I displays a tabulation of seven columns in which the ratings described and defined above are set forth. Three types of steam-electric generating plant are shown in order to demonstrate the application of the ratings to old as well as to new designs and types of stations. The values are trustworthy but do not portray any particular system. The arrangement of the columns from left to right is in the order in which one would develop the final ratings of the power supply facilities on an interconnected system. That is, the development proceeds from the Maximum Demonstrated Gross Output of the individual units to the really significant rating in terms of the satisfaction of System Load: the Dependable Net Capability.

The last column shows the Name Plate ratings actually applying to the generating units. Some of them are fairly representative of the Dependable Net Capability of the unit and others are too small.

The Name Plate rating is the reference rating for purposes of purchase, guarantee, inventory and general use. The Dependable Net Capability is the rating of genuine significance for purposes of budget and System Load supply. It would certainly seem desirable that they be as close, numerically as may be feasible from a practical standpoint.

Name Plate Ratings

It is of interest that the Name Plate and Dependable Net Capability ratings for the generators for the new plant in Table I coincide when the values for Maximum Gross Rating are 115 per cent of the Name Plate Rating. This plant will employ four stages of extraction for regenerative feed-water heating and will have moderate requirements for station auxiliary power. Some station designs may require a greater spread.

This discussion has been related primarily to steam-electric generating stations supplying the load of a distributed interconnected system, or of several such systems. Many of the principles and conclusions are pertinent to isolated or to concentrated systems. Systems incorporating more or less hydro-electric generation in the ensemble are susceptible to similar treatment. There are then more factors to consider, but a similar approach will lead to interesting and possibly helpful conclusions.

R. I. Utility Sells 1 Out of 3 Prospects Replying to Planned Store Lighting Mailing Pieces

A TOTAL of 25 planned store lighting layouts has been secured during the initial three weeks of an intensive promotional campaign on Planned Store Lighting which is being sponsored by the Electric League of Rhode Island and the Blackstone Valley Gas & Electric Co., Pawtucket, R. I.

"We obtained these 25 lighting jobs from among the prospects uncovered in only 77 return cards received from our first 3 weekly mailing pieces on Planned Lighting—a ratio of almost exactly one sale to every three return cards," it is reported by Paul Manchester, lighting sales manager for the utility company.

"We used the EEI mailing pieces and other promotional aids exactly as recommended in the store lighting program plan book," Mr. Manchester says. A return card to accompany each mailing piece was prepared locally. The card offers a free customer booklet on store lighting, which was delivered by a company lighting representative.

In deciding to begin planned lighting promotion, Mr. Manchester says, "we considered that the mailing list was the most important point. We carefully screened our commercial customers, making a new stencil for each, and included the name of the person to be contacted. We also built up a code classification with 49 customer groups, and keyed this mailing list to the normal meter cut-ins and cut-outs, as they come through our bookkeeping system."

Key company personnel who are not normally associated with lighting promotion such as commercial meter readers, power salesmen and others, are kept abreast of planned lighting promotion, according to Mr. Manchester. "We have found by past experience that these employees provide us with a large number of leads.

In addition to the 25 planned lighting layouts secured in the original stage of the program, Mr. Manchester credited it with responsibility for a large number of minor recommendations, such as "plus" lighting and electric signs.

The Planned Lighting Program, which is offered nationally by the Edison Electric Institute, was introduced in the Blackstone Valley Company's territory at a dinner-meeting held in September, with a capacity attendance of local contractors, architects, dealers and distributors. Displays were prepared to show the promotional materials provided in the program, and the background of the program was described by C. N. Snyder, of the GE Lamp Division.

We Like People

An article reprinted from the *Edison News*, an employees' monthly magazine published by the Boston Edison Company, Boston, Mass.

HOW can the employees in the Adjustment Division of the Public Relations Department pursue the endless tasks of settling customers' complaints, and still remain reasonably sane and happy? The answer lies in the fact that basically they like people.

While problems concerning customers' service bills are seldom of a mysterious nature, they do require the right answer, properly given, if the customers' confidence is to be retained or re-established. Finding the right answer often requires less knowledge of accounting or engineering than of the habits and foibles of the human race.

Accounting and engineering are helpful in determining what proportion of the customers' complaints result from mechanical discrepancies or clerical errors on the part of the Company. These constitute a surprisingly small percentage, and their solution entails only the routine correction of the discrepancy or error.

When the Customer Is Wrong

By far the greater portion of the complaints received are the result of thoughtlessness, lack of information and misconceptions on the part of the customer. The proper handling of these cases calls for the exercise of patience, persuasion, psychology, and, at times, perhaps even a bit of psychiatry.

As a matter of fact, when a customer questions his service bill, our first job is to verify the meter readings and registration, and to check the clerical work involved in billing. To limit the discussion to these factors alone, however, would be the poorest of public relations policies. The customer is the Company's source of income. When he has a problem in connection with his electric service it is plain common sense to try to help him solve it. A flat statement that the bill is correct will not suffice; it is the duty of the Adjustment Division, by careful consideration and tactful suggestion, to show him that in some way he has actually used the electricity for which he has been billed.

The explanation of electrical terms to the layman is sometimes little short of a fine art. For instance, no one has ever seen a kilowatthour, although they are sold by the millions every day. In conversing with customers, kilowatthours must often be compared to more familiar and tangible items such as quarts of milk or dozens of eggs. Then the elusive element of time, that fourth dimension which changes kilowatts into kilowatthours, may result in mixing the whole analogy of milk and eggs into a hopeless omelet, calling for a fresh start.

Tact & Diplomacy

The improper use of electric heaters is a source of considerable consternation to some customers who merely ascertain that the cost of operation is only a few cents per hour, and who forget how hours can be crowded into a month. The trick is to convince him that the heater caused his high bill, without also convincing him that the only solution is to hurry home and throw it into the rubbish barrel.

Defective wiring on a customer's premises, causing electricity to be wasted, is another difficult subject. To his way of thinking, Edison service includes everything from the Edgar Station to the inside of his portable radio; and whatever is wrong, he feels that the Company should fix it. Naturally, it is sad news to him that some vague electrical phenomenon which is costing him extra money on his electric bill is going to cost him more money to hire an electrician to repair it. But in one way or another he must be convinced, because repairing customers' wiring on private property is one of the things that Boston Edison just can't do.

Then there is the man whose family goes to the beach for the summer, leaving him all alone at home. He is sure that he uses almost no electricity, and is upset, to say the least, when the bill arrives for twice the normal amount. The meter must be wrong! On the other hand, could it be possible that he leaves the refrigerator door open all day? Does he forget to defrost it for weeks at a time? Does he rush away to work some mornings without turning off three plates of the electric range? Does he invite the boys in twice a week for all night poker sessions? These are all possibilities, even probabilities, but to suggest them without giving offense calls for tactfulness, if not downright diplomacy.

And so the efforts to make and keep friends for Boston Edison continue through year after year of explaining, expounding and exhorting. The constant objective is a deeper insight into the lives, thoughts and habits of the customers, for it is there that the real answers to most of their questions are found.

In justice to the great majority of Edison customers, it can be said that once they understand the nature of their problem and realize that a sincere attempt is being made to help them, they are both reasonable and appreciative. That is probably why, when all is said and done, the Adjustment Division still likes people.

Home Planning Booklet Issued by Electrical Living Committee

"PLANNING Your Home For Better Living—Electrically" is the title of a 32-page, full-color booklet just published by the Electrical Living Committee.

Intended to serve as a guide for both the home buyer and the home remodeler, the booklet emphasizes the importance of intelligent prior planning, and proper selection of equipment, to insure easier living and a really modern home. The low cost and greater efficiency gained by "building in" an adequate wiring system for the heavier electrical equipment is stressed throughout the booklet.

Text and illustrations are used to take the reader on a tour through every room in the average home, showing how each should be planned for the best use of electrical servants. The section on kitchens, for example, shows the three work centers of the modern electric kitchen, and how they may be arranged in any one of four basic designs, for maximum work- and step-saving value. The step by step modernization of old-fashioned kitchens is covered in detail.

Succeeding pages provide helpful information on planning for efficient use of electricity for better living in the laundry, bedroom, bathroom, living room and basement. Many types of lighting fixtures and lamps are illustrated and described. The need for an adequate wiring system is discussed at length.

"We feel that this booklet will show the average customer many new and de-

(*Continued on page* 427)

Highlights On Standardization in The Detroit Edison Company

By Arthur J. Beck

Editor, The Detroit Edison Co. Standards Catalog

An address before the Transmission & Distribution Committee, EEI, at a meeting held in Philadelphia, Pa. on October 9-10, 1947.

STANDARDIZATION is an important management tool for effecting savings and other economies through the process of simplification. Much has been accomplished in this field, yet there is probably still much to be done, even in those companies which have a standards program. There are always new improvements and additional savings which can be made. Off hand, it may seem that once a standards job has been done, you can forget standards and devote your time to other things. Such a policy I believe, fails to recognize that standardization is a continuing process. New ideas, products and methods are always being developed. If you are to keep your Company up-to-date with the times, you will have to be considering them continually and adopt those which are good.

When we speak of standardization, several different concepts are apt to occur to each of you. Some immediately think of design standardization; others of standardization of drafting practices; of construction practices or operating procedures; others may think of rates charged to customers; of personnel practices and wage rates; and to still others it brings up consideration of materials and equipment standards. In general, we, in The Detroit Edison Company, are concerned with all of these. However, I shall limit my remarks to materials and equipment standardization, which, as many of you know, has been of active interest with us for more than 20 years.

What Is Material Standardization

Materials standardization, as we think of it, consists of simplifying the variety of materials we use for construction, operating, and maintenance purposes, adequately describing the items we select for future use and then seeing to it that these materials and their standard descriptions are used in our day-to-day operations.

In other words, we review the materials which we have been using and weed out those which really are not required. For those items which make up our standards, we establish descriptions which are clear, but concise. Each description is adequate to describe the item, yet is short enough to be used as the working reference in the many steps of supply, such as requisitioning, on purchase orders, on Stores records, for stock accounting, etc. We are concerned not only with the use of the standard items in the field but also with the use of the standard descriptions in the various steps of our supply operations.

Need For Standardization

When the company was smaller, we had a relatively easy situation. Our structures were rather simple and could be built to answer the purpose satisfactorily without a lot of preliminary design. When our construction people ran into trouble, they changed materials on the spot to give what appeared to be a better answer. This method was all right as long as structures were few and construction organizations relatively small.

Difficulties arose, however, as the company grew and expanded its forces. We found that too great a variety of materials were being used by the company to get the job done. This became particularly apparent during the late 1920's when we were in the process of doubling our installed capacity. Considerable attention was being given to our major power plant equipment, to the principal distribution and transmission items, as well as to major substation equipment. However, the smaller items which are required for an installation such as relays, wire, bolts, tools, etc., are as important as the major items. Without them, the major items will not function. Frankly, we had not been giving sufficient attention to these so-called minor items.

In the process of expanding our facilities, we felt that we were using too many items to do the job. We were buying some 50,000 items per year and stocked some 12,000 of them. In handling the supply problem for this expansion and in controlling our stocks, there was considerable confusion. Our records and requisitions were often rather badly garbled, so that we actually did not know what we were to buy or what we had in stock. As a result of this, we received too often the wrong material and had to pay additional freight costs as well as wait for delivery of the right items. Also, at times we were carrying several stocks of the same item. It was not unusual if some of these stocks never moved. In other words, we had an investment which did nothing for us. Our warehouses were becoming crowded with excessive stock, and at that time warehouse space was very critical. Each dollar which we had invested in stocks was not doing the maximum job for us and we were paying taxes on some stock, which was in effect so much dead wood.

Clearing Deadwood Stockpiles

In addition there was an accumulation of so-called private stocks in the operating departments. These operating departments were reluctant to rely upon the Stores Department for the supply of essential materials. The experiences mentioned above certainly were contributing factors for this conclusion. Our purchasing people felt there was an excessive number of purchase orders being issued, due to the frequent ordering in small amounts, and also several departments using different items for the same purpose. We felt that an unusually large number of trade-named items were being furnished without competition. Further, it appeared that too many specially designed items were finding their way into the company's practice.

In addition there was considerable feeling that the classification of materials and equipment which we were using for the control of stock and the recording of our purchases could be materially improved in the interest of assuring that

like items were brought together. The classification we were then using was arranged according to use. As a result, to find out our position on wire, we had to refer to 7 different classes.

An important area where we had learned about the benefits of adequately considering all the items required for the job was in the field of Overhead Lines material and construction standards. Our good friend, Howard Seelye, pioneered this area for us. His work really became the forerunner for our broad standardization program which covers all of the material which the company uses.

Our Standards Program

Our company set about correcting these conditions of too much variety and too much confusion by establishing a Standards Program. A Main Standardization Committee was appointed with the job of establishing overall policy. This committee is made up of the vice-president in charge of Engineering, the chief engineer of the System, general storekeeper, purchasing agent, and the editor of our standards catalog. This committee established the aims of our materials standardization program to be:

1. The establishment of a satisfactory materials and equipment classification. This is the basis for keeping our stock records, and also is the basis for our cataloging.
2. Agreement upon and use of a standard terminology in the description of all materials.
3. Establishment of adequate specifications for purchase.
4. Minimizing the number of different items purchased and used by eliminating superfluous types and sizes.
5. Coordination of our decisions with the American Standards Association and other nationally recognized standards.
6. Publication of a Standards Catalog containing standard materials and equipment. This catalog would include standard items carried in stock and also standard non-stock items which we buy direct for the job.

Organization

The Main Committee decided that best overall results would be obtained by enlisting the participation and support of all departments. They, therefore, appointed a number of subcommittees to be responsible for the development of our standards. These subcommittees include one on classification, one on publishing the Standards Catalog and 18 subcommittees to standardize particular classes of material. The personnel on these subcommittees is kept small in number so as to get the maximum amount of work done. However, it was early recognized that with such a small membership all interested departments of the company did not have a voice in the establishment of our standards. To correct this situation, we have followed the policy of calling in as consultants interested personnel in departments who are not formally represented on the subcommittee.

The Standards Division of the Purchasing Department was delegated the job of publishing the Standards Catalog from the reports submitted by the various subcommittees. In actual practice, however, it was found that the subcommittees did not always submit complete or accurate reports. There was a tendency for too much haste and too little investigation. The detailed study required to get all the facts, so that a satisfactory decision could be arrived at, was often omitted. As a result, the Standard Division now assists the subcommittees and supplies them with necessary information. The Standards Division personnel, however, do not make decisions. Rather, they are fact finders and refer to the subcommittees for necessary decisions.

How A Subcommittee Operates

Each subcommittee reviewed and considered a list representing the purchases of all items in the class assigned to it. This list was furnished by the Purchasing Department and was a most useful tool to work with. It enabled the subcommittee members to know readily what the company was using, who was using it, and the relative volume and frequency of our purchases. Of course, the use each item was put to had to be obtained from the using departments.

Armed with this information, and also, with the knowledge as to what national standards and what manufacturer's standards were available, the subcommittees went about their task of finding the right item to do each job. In the process of this study, they tested material and considered design, quality, service and price. They reduced the variety of items we were using by means of replacing one item by another; by eliminating superfluous sizes and special dimensions; by improving designs of some products, eliminating items which were too good for the job at hand, and sometimes those which were not good enough. In the course of all this, the subcommittees kept in mind the principle that the source of our supply of any item should not be limited. Rather, emphasis was placed on establishing several sources so that our buyers could develop a maximum of competition and also, have several reliable sources from whom we could obtain delivery.

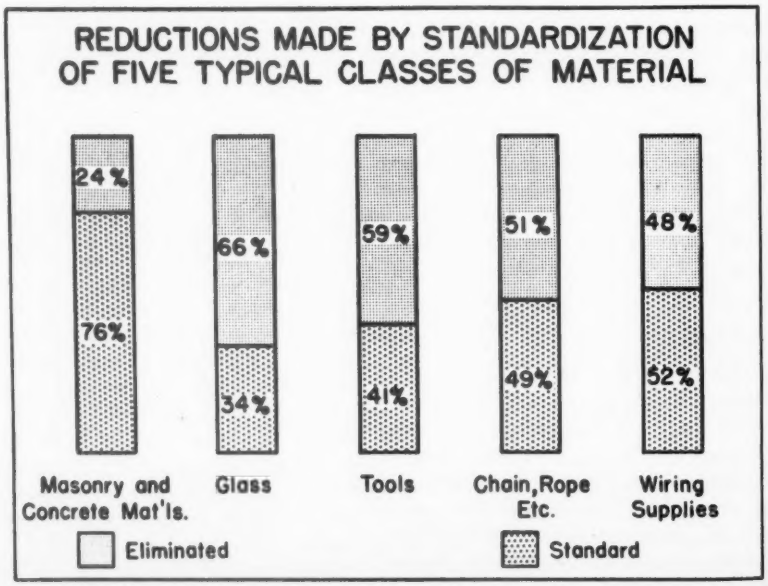


Fig. 1—Chart of the Reductions in Variety in Five Typical Classes of Material Standardized by the Detroit Edison Company.

FORMER CATALOGING OF BOLTS

Machine Bolts, Galvanized, with Square Nuts.

Diam x Lgth. Inches	Stock Number
3/8 x 1	5410-805
3/8 x 1-1/2	-782
3/8 x 2	-791
3/8 x 2-1/2	-792
3/8 x 3	5410-797
3/8 x 3-1/2	-793
3/8 x 4-1/2	-806
1/2 x 1-1/4	-800

PRESENT CATALOGING OF BOLTS

Machine Bolt, Sq Hd, Galv, Sq nut. Rolled thd, EEI Spec TD-1. (Steel, regular unfinished hd. Regular nut. Purchase unit: 100. Stock unit: Each.)

Diam	Thd Per Inch	Length	Ed. No.	Whse
1/4"	(20)	x 5-1/2"	251-0051*	25
5/16"	(18)	x 1-1/2"	251-0052	-
3/8"	(16)	x 4"	251-0289*	25
3/8"	(16)	x 5"	251-0291*	25
3/8"	(16)	x 6"	251-0293*	25

* Stock item.

FORMER CATALOGING OF WIRE

Wire, Single Conductor. Brush Holder Wire, Rubber and Double Braid Covered.

Number of Wires in Strand No. 25 B & S Gauge	Thickness of Insulation	Stock Number	Unit
25	3/64"	3207-021	Ft.
50	3/64"	-022	Ft.
50	12/64"	-070	Ft.
100	1/16"	-024	Ft.
200	1/16"	-026	Ft.
350	6/32"	-028	Ft.
650	6/32"	-003	Ft.

PRESENT CATALOGING OF WIRE

Wire, 600-Volt, Rubber and Double Braid. Copper, stranded, soft, tinned. Insulation DE Spec 98. Wp cotton braid, ASA C8.19. (Tape and single braid is acceptable. Purchase and stock units: Foot.)

Size	No. of Strands	ASTM Spec	ASTM Class	Insulation Thickness	Use	Ed. No.
8 Awg	41	B174	I	4/64"	(a)	713-0035*
2 Awg	7	B8	B	4/64"	(b)	713-0040*
2 Awg	133	B173	H	4/64"	(a)	713-0047*
300 Mcm	37	B8	B	6/64"	(b)	713-0290*
500 Mcm	37	B8	B	6/64"	(b)	713-0292*

Use: (a) Meter Leads.
(b) Power wiring.

* Stock item.

Fig. 2—Comparison of the Cataloging Practices Before and After Revision of the Standards Catalog of the Detroit Edison Company

Examples of how much we reduced variety are indicated in Fig. 1.

When standardizing materials, there are certain precautions which must be continually borne in mind. First, overall economy should be a basic criterion, particularly when considering whether to cut down or eliminate sizes. It may be more economical to retain 2 or even 3 sizes in preference to eliminating all but one size. For example, in our practice we use 2 sizes of 96-in. crossarms. The lighter arm is used the most but of course is not suitable for certain loadings. We could use the heavier arm for all loadings. However, this would involve an additional 28 per cent in crossarm cost. Such an increase would not be offset by any savings due to the elimination of a stock item.

A second precaution, when considering the elimination of an item, is that all of the uses for it be known—even the occasional uses which have a habit of recurring at infrequent intervals. Otherwise, there is apt to be considerable difficulty when the need for the item later arises and it is no longer available, having been eliminated from stock, and it is difficult or impossible to find an adequate substitute.

Putting The Standards To Use

After the subcommittees have decided upon the standards, it is necessary that this information be broadcast to the company and made available to our designers, engineers, Stores Department, and the using departments. Descriptions of the items, of course, are a vital part of this procedure. The description of our standards items are developed by the Standards Division of the Purchasing Department. We aim to make the description of each item clear and concise with adequate but not superfluous information. The description should be such that it gives you a mental picture of the item and that one *and only one* item will meet the description. In the process of setting up a description it is essential to consider not only the individual item, but also similar items which are currently used, or which might possibly be used by the company. This is important if we are to achieve clarity and conciseness, eliminate confusion in our cataloging, and reduce to a minimum the need for changing a description once it has been established.

Examples of our present and former practices regarding descriptions can be seen in Fig. 2. That portion of the description which is *outside* the parenthesis is the ordering description; that *within* the parenthesis is useful information for designers, requisitioners, buyers, etc.

Under our former practice, essential information was locked up in the head of some engineer. Our current policy on descriptions however, has helped both our technical and non-technical people. Every one has had sufficient information in the catalog to do a good job. The newer policy has really paid dividends during the last few years when materials were hard to get. Our buyers and Stores Department were in a better position to suggest substitutes because they knew in detail from inspection of the ordering

descriptions and Standards Catalog exactly what we needed. All of this is not to imply that our non-technical people give decisions affecting the technical characteristics of material. Rather, they are able to answer any questions of a technical nature, which in the absence of a clear description, they would have to obtain from our engineers.

The description proposed by the Standards Division is approved by the subcommittee before it takes effect. This is in keeping with our policy that the using department is responsible for specifications.

After the standards description has been approved by the subcommittee, they are circulated to the company by means of our Standards Catalog. This catalog contains both our stock and non-stock items which have been approved for standard use.

We believe that this catalog, is in effect, a selling document and is the silent salesman for our standards and for our stock. Because of this, we have adopted some of the technique of the Sears Roebuck Catalog. In making up our Standards Catalog we use pictures and other devices to convey our message, and make the Catalog readily understandable to our people.

The Standards Catalog contains some 1000 pages which list, describe, and illustrate the standard items (regardless of whether or not they are carried in our stock) which are required for our construction, maintenance and operating programs. Major equipment and spare parts are not included.

This catalog is used by our designers, engineers, and other requisitioners in the using departments. It is the Stock Catalog of the company, and is the basis for writing requisitions, both for stock and for purchase. We have 450 copies of the Catalog in use throughout the company. Some of these are complete catalogs, covering all materials and others are partial, depending on the needs of the individual.

Control Of Standards

Standardization is really worthwhile only when continued attention is given to it by an experienced staff. Otherwise, it will not be long before you find yourselves back in the old condition of too much variety, and too much confusion. New ideas and materials are continually coming up. If the company is to keep abreast of the times, these new materials should be considered and adopted, if they make for better construction and lower ultimate cost. To this end we have the following policies regarding the control of standards:

a. Complete elimination of the purchase and use of non-standard items is not desirable.

b. A requisitioner should not have to wait for committee action before procuring a non-standard item.

c. New materials and methods should be continually tried so as to keep the company up to date.

Benefits

Definite figures on the actual savings resulting from standardization are not available. A reduction of 25 per cent in the number of stock items in five classes of material, such as builders' hardware, bolts and screws, firebrick, wire and cable and chemicals, is impossible to evaluate in dollars. Likewise, the fact that our designers have fewer items to consider, and for these items have standard descriptions which permit a saving of considerable time in making drawings and bills of material can not be directly translated into dollars.

However, we do feel that the time and effort we devote to standardization pays us good dividends.

Bernard F. Weadock

BERNARD F. WEADOCK, Vice President and Managing Director of the Edison Electric Institute during its formative years, died at Ojai, Calif., on October 26, after an illness of many months. His age was 63.

MR. WEADOCK

Mr. Weadock came into prominence in the electric industry through his work as special counsel to the utility associations during the Federal Trade Investigation of the electric and gas industries. In March of 1932, he was appointed Executive Director of the National Electric Light Association. After its dissolution in 1933, he was elected Managing Director of the newly organized Institute. A man of unusual ability, warm-hearted and forthright in character, he served the Institute with distinction for six years, winning and holding the genuine affection of his associates. In 1939 he resigned to engage in the general practice of law, first in New York and later in Washington, D. C.

Born in Saginaw, Michigan, in 1884, Mr. Weadock studied at the University of Michigan in 1902-03, then transferred to the Detroit College of Law, from which he graduated in 1905 with the degree of LL.B. He was admitted to the Michigan Bar the same year, then beginning in the office of the Corporation Counsel of the City of Detroit, later became Assistant Corporation Counsel. From 1912 to 1920 he acted as General Attorney for the Detroit United Lines. From 1920 until 1924 he was engaged in the general practice of law in Detroit.

In 1924 he came to New York City, becoming a member of the firm of J. C. and B. F. Weadock, specializing in corporation law. In 1928 he severed this connection to become special counsel to represent the utility associations in the Federal Trade Commission investigation of the electrical industry. He continued to serve in that capacity concurrently with his work as Managing Director of the Institute until the conclusion of the Federal Trade Commission investigation.

Surviving Mr. Weadock are his widow, Mrs. Mary Weadock, formerly of Greenwich, Connecticut, and four children: Bernard F. Weadock, Jr. of Los Angeles, California; Mrs. James Spence, Miss Shirley Weadock of New York City and Mr. John Cullen Weadock of New Milford, Connecticut. Funeral services were held at Greenwich.

Random Observations of an Itinerant Business Man

By Ashton B. Collins

Excerpts from recent talks before the Rocky Mountain Electrical League, Montana-Dakota Utilities Group, and Indiana Electric Association.

THESE observations reflect a crystallization of my thoughts as I travel around this country of ours. As nearly as possible, they are based on what might be called grass-roots interest of the individual operating companies.

Grass Roots—Your Associations have really carried on in grass-roots fashion in war as well as in peacetime. My conception of grass-roots is that of local or state operation as contrasted with national organization. I might properly compare it with "States' Rights" as contrasted with the recent trend to political development of Federal bureaucracy whereby individual states are encouraged, if not forced, to ask for Federal aid, instead of relying upon their own state economy.

Political Economy—That sounds as if I had political economy on my mind. At least I do have economy in mind and it seems to me that the business man of today who does not, as an individual citizen, keep in touch with the political picture and his representatives in Congress, is negligent of his own interests and those of the business-managed system to which he owes allegiance. And yet we find only a small percentage of people keeping our Senators and Congressmen informed of our needs to keep business healthy.

Will our negligence bring on the
"brave, new days
"That lie just ahead—
"When we won't have to work
for things,—
"Just vote for them instead!"

Your Taxes—Take the all important matter of Federal taxes, which have milked the states and built up a Federal bureaucratic octopus in Washington that is eating its head off. Every one has a direct interest in this. Many of us were youngsters when the Federal income tax bill was enacted in 1913. I am told that the Congressmen who enacted that law at that time said that the tax probably would never get above 6 per cent. Yet, taxes have reached as high as 95 per cent of income.

The young men in this industry are paying a heavy penalty in those taxes today even though they were not able to say anything about them when they were enacted years ago.

Ask yourself, what are you doing as an individual not only to stop the continued growth of that Federal octopus but to make it shrink back to normal size?

Get Off the Defensive—As individuals we won't get anywhere on the defensive—we must take the aggressive. Did you ever hear of a defensive football team winning pennants? No. It's the team that is constantly on the aggressive. Unfortunately, for awhile our industry let the government bureaucrats beat us to the punch. With unfair government competition, we were on the defensive for a long period. Then our leaders woke up and got going.

Power Shortage?—Not on Your Life—On the contrary, every company is turning out a record amount of electricity, breaking all previous records. Although there is very little spare capacity anywhere, *there is no shortage of electric power by any electric power company anywhere in the United States.* In other words, to put it positively, there is an excess of demand over supply.

What the bureaucrats like to call a power shortage is merely a demand on the part of the people everywhere in the United States for more and more of the finest electric service in the world. The war taught the American people more than ever the great values of electricity.

The Women Learned, and How!—During the war, women went into industry by the millions—they worked with electricity in labor saving devices and they worked under brilliant lights. Now they want those things at home and they are going to get them because the electric industry is going to see that they get them. The woman of today is being emancipated from household drudgery and the American laboring man is constantly getting more electric power at his elbow than any other worker in the world. The electric industry was not caught short during the war and is constantly increasing its output over and above all past records even though the industry was prevented from ordering new equipment during the war. Now the industry has announced a five-year expansion plan involving five billions of dollars.

Keep Selling!—So I say that even if this coming winter should bring up tight situations or temporary breakdowns that would make it necessary for individual power companies in a few instances to hold some customers back from too great a use of electric power, the industry as a whole can properly point out that it is still breaking all records and will continue to do so.

Government Competition With Its Own People—In regard to unfair government competition or invasion of the Free Enterprise System, I want to point to a couple of recent examples:

The statement has been made in the past, that if the government took over part or all of the electric business, it would then take over other businesses. Now this has just happened in Porto Rico, a United States possession.

What Goes on in Porto Rico—Several years ago, under pretense of war necessity, the United States took over the electric business in Porto Rico and now that same government has started a chain of grocery stores in Porto Rico, whereby the government sells groceries in competition with the grocery merchants in Porto Rico. So we had better start calling the attention of our grocery friends over the United States to watch out because they are liable to be next.

Now the Jewelry Business—Next come the jewelers. Our friends in the jewelry business have just discovered that their own United States government is selling jewelry in its Army Post

Exchanges over the country in competition with jewelry stores, so we had better help our neighborhood jeweler, as well as our neighborhood grocer. Jewelry sales by the U. S. government at cost and tax free! No wonder the jewelers are mad.

And the Railroads—And along come the railroads, suffering from this same unfair competition of their own government. I can do no better than quote two recent statements on this score:

1. An advertisement of the Pennsylvania Railroad entitled "Stockholders in Other Business Have a Stake Also in Railroads"—"should be interested in fair treatment for railroad stockholders. Under government operation, taxes to support the railroads would fall principally upon other corporations—owned by their stockholders. . . . In other words, stockholders everywhere would be penalized."
2. President Fraser of the Katy Lines stated in an address in St. Louis "Government furnishes almost all the fixed investment required to carry on most other forms of transportation without, in most cases, making adequate charge for the use of such facilities in carrying on the business of commercial transportation. It is quite obvious, therefore, that the railroads vitally need the sympathetic support of the public, etc."

Who's Next?—So you see, this matter of government competition is a problem also for the railroad man. We are in the same boat, power companies, railroads, grocers, jewelers. (Not to mention the doctors, and their concern with the threat of socialized medicine, as well as other businesses that the government has invaded through organization of 44 government corporations.)

What to Do!—A chain is no stronger than its weakest link and all of us in the Free Enterprise chain, whether we be utility men, railroad men, grocers or jewelers, are going to have to convince our Congressmen that the government must stay out of competition with its own people.

Adequate Wiring—Speaking of shortages, if we want a shortage to worry about then we'd better start thinking about the adequate wiring shortage in the thirty million old homes in this country. There are thirty million of us who can't give up our own old homes even if we wanted to, but we can do something about the lack of modern electric wiring in those homes. This is a problem that we cannot afford just to give lip service to. If the milk industry lacked bottles to distribute their milk they would do something about it mighty fast, even if they had to make the bottles themselves and our industry must really get aroused on this bottleneck of ours if we're going to eliminate it.

Go All-Electric—Yes, there are some I know who will say that there will be time to worry about that when we get over the lack of equipment, transformers, wires, and appliances—but we'd better not let it fool us. The next turn in the business road may be down hill. Now is the time to crystallize our thinking and the public's in the Go-All-Electric Program.

Sell Our Own People First—We have had some eight years or more during which we could do comparatively little promoting or selling (order taking, yes) and now we must start all over again and indoctrinate employees and sales forces in the all-electric story—else we will find our people just selling appliance gadgets and overlooking the great story of electric service from behind the outlet. We must lay our plans to make every home an all-electric cathedral, not just bricks and timber.

And we must start with our own people. There are literally acres of diamonds in our own backyards. Here's what I mean:

Quarter Million Members for All-Electric Clubs—We have over a quarter million employees and salesmen in this electric industry. That is the first place to start to make every employee and salesman not only electric minded, but to practice what we preach, by making their homes all-electric. We should start forming all-electric clubs of employees and salesmen. We must make them pace makers. Power companies and manufacturers and dealers should all cooperate in this endeavor. The employees of the power companies should be entitled to buy their own goods at cost just as other businesses give their employees the privilege of buying their own products at cost. I see no reason why the power companies could not set up a definite plan and special prices to encourage their employees and salesmen to equip their own homes with all the electric appliances they can use. The plan should provide for low monthly payments spread over a long period to be deducted from the employees' monthly pay checks. Let us not leave employee and sales participation to chance, but let's plan it so that it will become almost automatic, industrywide. Plan it! Don't trust to luck. Carry a rabbit's foot if you will, but remember it didn't work for the rabbit.

Many Employees Just Don't Know—I don't think I can over-emphasize the need of indoctrinating employees and salesmen with today's all-electric story. I say this advisedly because the industry now has thousands of new employees and new salesmen who have come into the business in the last eight or ten years. All those new ones, plus many others naturally can't remember when electricity cost 25 cents a kilowatthour in comparison with today's price. They can't be expected to remember the time that convenience outlets were installed for a dollar an outlet.

Many of our people can't even remember just a few years ago when a customer or prospect could walk into the office, or telephone, and get new wiring or new outlets or new appliances the very next day.

As a result, many employees and salesmen in this industry don't know the latest and best ways in which to sell or to render service courteously and attractively to the public. This is not just true of our industry. It is true of many industries, probably as a result of war and its attendant problems.

Labor Saving or Comfort Giving—When we contemplate the grand opportunity of selling electric service, and the vast line of electrical appliances that are either labor-saving or comfort-giving, we must sell ourselves first on the need of placing all our forces in a position to properly tell this great story to our public.

Sell Up to Dollar Value—Above all, we must never forget to sell up to dollar value in our service and not down to penny cheapness. I have spoken before on this subject and yet can never forget how vital it is to the success of any business because I remind myself of what has happened to other businesses that sold down to penny cheapness, whether it was the railroad business or the telegraph business with its telegrams that got below cost; or the New York subways that have maintained a nickel fare and gone into bankruptcy. Or the soft drink people who plugged nickel, nickel, nickel and then had to go to six cents. Even the airplane business made the mistake

of selling down to cheapness until they had to increase fares recently.

"Profit" Must Be Kept Honorable—Fortunately the electric industry was built on the profit motive and has maintained a good financial position but we will have to be ever watchful of it, particularly of that word "profit." America was built on this work profit and all of us, whether salesmen or employee, all of us in business must see that this word profit is kept honorable. Unfortunately the New Deal philosophy tried to make a disreputable target of this word profit. That's why we must maintain our merchandising and other selling standards in this industry on an honorable profit basis and not sell down.

Repackage for the Mass Market—To do these jobs, we should reset our sights in the light of today's business and not just live in the past. We must repackage our story for the modern market and particularly for the mass market of the American public all of whom are customers of ours because they either buy or use electricity and its many appliances.

Young People Especially—Above all, we must redirect our story in the right language to the young people of this country. Too long did we neglect them and then for the past eight years our industry had little time to talk to them because we were in a war, or getting over it. But all that time young people were coming of age at the rate of over 2½ million a year. In eight years that is twenty million of them now of age, getting married and becoming customers. They were not interested in our story then, but they are interested now. They haven't got time to read long winded studies of our business or our products. We can't stop them long enough to "educate them in our business."

They Think, Buy and Vote Emotionally—We must talk to them in the terms of their wanting minds because they think, vote and buy emotionally.

Needs are not too important, but their wants are important and we must dramatize our story in terms that they can recognize and like.

Human Interest—It boils down to a story of human interest. Shorn of its technicalities, the electric business is one of the most human and gripping businesses of all times and can be packaged and delightfully tied up with the blue ribbon of human interest.

"Sugar was just sugar until it was packaged and Dominoed"

"Ask the man who owns one"

"Ivory Soap—99 44/100% pure"

"The pause that refreshes"

Elsie The Cow—Speaking of human interest, what better example could we have than that of Borden's Elsie the cow, which is just as appealing to the folks in the West (who've grown up with cows) as it is to the people in the teeming cities.

Reddy Kilowatt—Somehow this reminds me of Reddy Kilowatt. (Now, now, Ash—Ed.) I may be pardoned for referring to him because I do so in terms of the companies that use him.

Practice What We Preach—Briefly the Reddy Kilowatt Program is being repackaged very largely to teenagers. In other words, we are practicing what we preach.

Seeds Planted 10 Years Ago Bearing Fruit Today!—Companies in different parts of the country report that young customers, 22, 23, and 24 years of age are coming in voluntarily to power company stores today and buying electric ranges because as boy or girl scouts nine and ten years ago, they joined the Reddy Kilowatt cooking clubs and have grown up accustomed to electric cooking.

Reddy Made Magic—Other power companies report that their Technicolor motion picture film on the story of electricity "Reddy Made Magic" is being popularly shown in first run theaters. Others report their schools asking for the film.

Franchise Booklets for Kids — Still others report children taking franchise election booklets away from their parents because of the Reddy Kilowatt illustrations in those books.

And over one million comic books, "Reddy Made Magic" and "Edison, The Man Who Changed the World," have been distributed to youngsters.

Customers Buy the Company's Trademark!—Perhaps one of the most surprising happenings is the report of the companies making their Reddy Kilowatt pins and display figures available to the public at cost because the customers began asking for them. In other words, the customers want to buy the replicas of the company's character.

Reddy Kilowatt Word Contests for Young People in New England—Companies have had great success with teenagers through contests to see how many words the youngsters could make out of the letters in Reddy Kilowatt's name. Teachers were so intrigued with it that they made it class study. This idea was developed by New England companies.

Dramatic Ads—In advertisements, too, the power companies are beginning to talk in more dramatic fashion. Several recent ads show what a long way the industry has come from the technical, factual and dignified advertising of just a few years ago.

Gee Whiz—Or the company in Iowa with an alluring picture of a baby with the title "Gee Whiz—Baths Are Fun When Reddy Kilowatt Pumps the Water." And the ad reads "No more tiresome, back-breaking water carrying on your farm when Reddy Kilowatt, with his dependable electric power pumps all the water you need—quickly, economically and safely. An Electric Water System for your farm means running water for your kitchen and bath, as well as for your other farm buildings."

And then this one from a company in Wyoming: "for *quick action* Electric *outlets* at your elbow—

"Tired of Housework? ('Housework is so Daily.')

"Want more time for Rest or Play? (Who doesn't?)

"Then get more Reddybox Electric Outlets for Quick Action!"

And I could give you many more examples of the human interest and dramatic way in which power companies are beginning to tell their story to young, as well as old.

Yes, We're Making Progress—Yes, we are making progress as an industry. We've come a long way from the stuffy, technical array of facts to adults only.

The door is wide open and tomorrow is a new day. We're in a grand business. Let's take stock of where we stand and then take the aggressive.

On the way over, I asked myself how would I sum up our story today? Here it is:

WHERE DOES THIS GREAT INDUSTRY STAND?
THE RECORD SPEAKS FOR ITSELF!
ELECTRICITY SPEAKS!

In 1752—Ben Franklin, private American citizen proved lightning and electricity were the same.

In 1879—Thomas Edison, private American citizen, put electricity into a lamp bulb, and then three years later built the first electric plant. That started the U. S. on the road to world electrical supremacy.

Result—

By 1917 the United States had more electric power than any other nation on earth.

The FACTS You Want *Them** to Know About Wiring—Colorfully Presented in These Illustrated Talks on

1. Adequate Residential Wiring
2. Commercial Building Re-Wiring

Builders . . . Building Managers . . . Customer Groups . . . Contractors . . .
Utility Employees . . . Inspectors . . . Architects . . . Engineers . . .

Now you can bring the story of adequate wiring, in visual form, to the people you want most to reach —those who plan and sell new and remodeled wiring systems, and the customer who wants all the benefits of adequate wiring.

Two authoritative illustrated talks, prepared by the Edison Electric Institute's Wiring Committee, will help you to spread knowledge of the new wiring materials and modern methods throughout your area. Extensive use of these lectures will aid your customers, employees and others to understand, perhaps for the first time, the importance of adequate wiring, and its contribution to electric appliance efficiency.

Each lecture is organized in several suggested sequences, custom-tailored to appeal effectively to the interests of the above-mentioned audiences. Special introductions and closing remarks, especially designed for each group, are provided.

Sets of Kodachrome slides are supplied as integral parts of each lecture, to help the speaker to dramatize the need for good wiring, the faults of outmoded systems, and to assure full audience understanding of each point.

The wiring lectures, with slides, are available from EEI. A set of 45 Kodachrome slides, for the commercial lecture, is priced at $25.00—a set of 48 slides, for the residential lecture, at $25.00. For additional information on these lectures, address the Commercial Director, EEI.

EDISON ELECTRIC INSTITUTE
420 LEXINGTON AVENUE NEW YORK 17, N. Y.

That electric power production helped win World War I.

By 1929 that same electric power developed by private citizens made the U. S. the greatest manufacturing country—played an important part in giving its people the highest living standards on earth—and helped prepare the country for any emergency.

In 1941 the U. S. produced more electricity than any other six countries put together.

In 1945 the U. S. produced three times as much electricity as Germany, the next highest country, which was a basic factor in the winning of World War II.

The greater part of that power was developed by private U. S. citizens investing and risking their own time and money—without one dollar of government money and without the help of any government agency.

And those citizens paid heavy taxes on every dollar of profit.

By 1950 lots more of this finest and cheapest electric power on earth will have raised U. S. electrical production and living standards still further above any other nation in the world.

All this by individual U. S. Citizens under the Free Enterprise System.

What a Record!

Electricity is indeed in good hands!

Let's not tie these hands with any red tape!

Knowing these things, I for one have a Creed to guide me.

Creed

I believe this is a fine industry.
I believe further that this industry is doing as fine a job of service for the people as any other branch of American enterprise.
Believing these things, I am ready to stand up and be counted.
I am ready to fight for these principles and for this business.
You and I know that it is the best electric service in the world.
And there is nothing that can stop us if we but have Faith and Will to Do!
All of us must be salesmen for every phase of the electric business; and with a singleness of purpose, backed by unstoppable team work.
Shakespeare said: "Thinking makes it so. And nothing man ever built arose to touch the clouds except for some man's wish to see it rise, some man's belief that it could, and some man's will that it must."
I believe IN THIS INDUSTRY.
I believe.

Trends in Construction Costs

By J. P. Anderson

Ebasco Services Incorporated, New York City

An address presented before the Engineering and Operation Section, Southeastern Electric Exchange, Atlanta, Ga., on September 25, 1947

EVERY major war has carried with it increased cost for all types of consumer goods and for construction. These increases are normal for the abnormal situation existing. Manpower is diverted from production of consumer goods, from construction of facilities devoted to the production of these goods, and from essential related services. Money is increased—goods are decreased—and prices rise.

During the war, material prices and labor wage rates were controlled, but not all pegged to a fixed level; hence construction costs rose steadily throughout the war period. This steady upward trend has continued with different degrees of intensity, following such historic events as the end of hostilities and the removal of price controls. With meatless days again in prospect, the recent spiral of prices will be reflected in heavy-industry cost indexes when they are projected to the end of this year.

Whether we are in the intermediate zone of a hurricane of rising prices or fast approaching the vortex is problematical.

While the title of this paper is "Trends in Construction Costs," you all know that the trend is expressed by a short word of two letters, U-P, up. We shall accordingly discuss features of design and construction of steam power plants that have a bearing on the trends in cost, and cite some examples of transmission line work.

General Construction Cost Trends

On Fig. 1 there are plotted index values for construction-labor wage rates, wholesale building-material prices and general construction costs, based on cost levels as they existed in 1913—assumed as equal to 100. The chart shows the relative changes which have taken place since that time, and is included here to

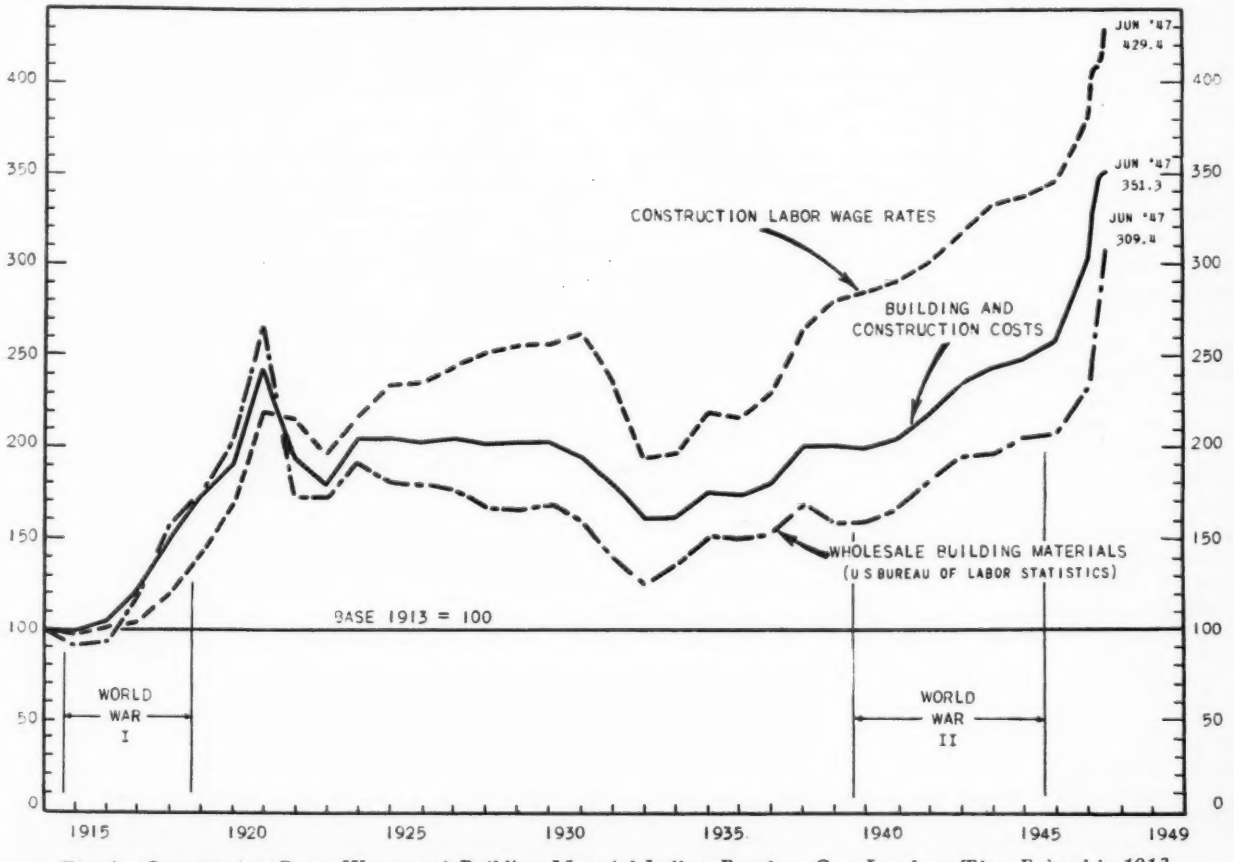


Fig. 1—Construction Costs, Wages and Building Material Indices Based on Cost Levels as They Existed in 1913, which is Assumed to be 100.

Note the effect upon construction costs since the end of 1946, caused by increases in construction wages and building material prices. The cost of basic materials, commodities, equipment and services of all kinds follows the trend of wages, since labor costs are the dominant element in their overall cost.

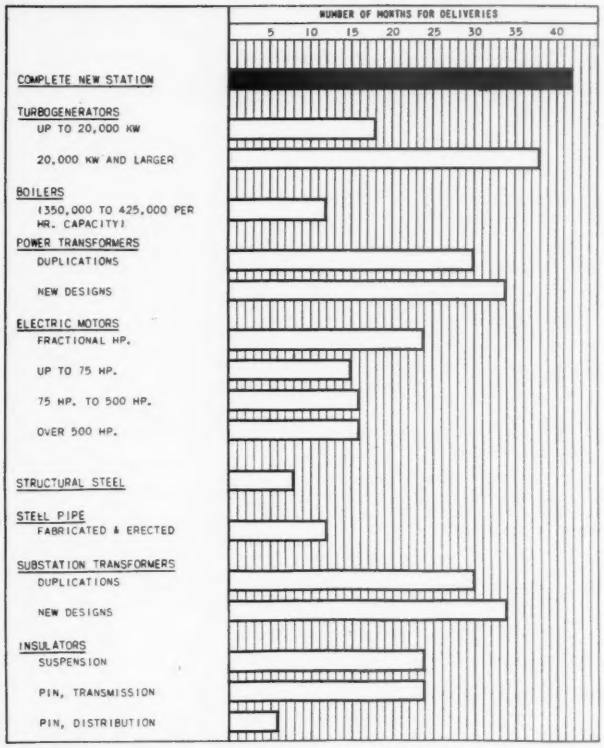
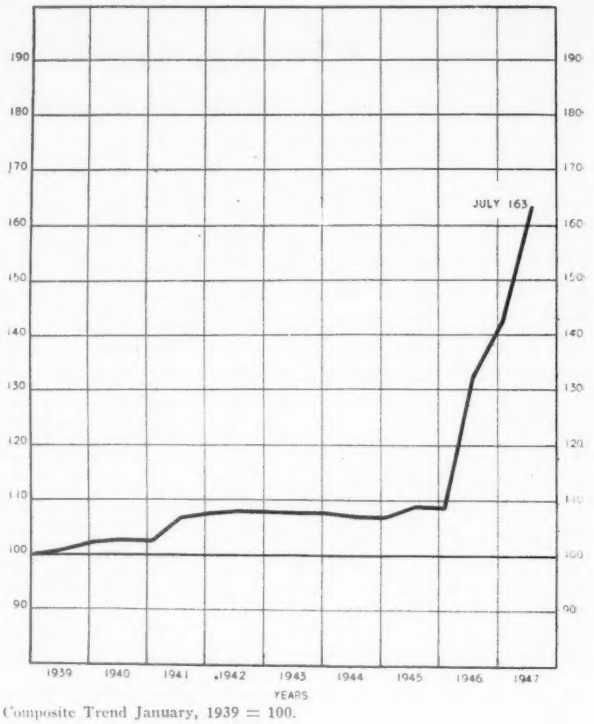


Fig. 2—Current Critical Material and Equipment Deliveries for Steam Electric Stations.



Composite Trend January, 1939 = 100.

Fig. 3—Index of Cost Trend of Principal Equipment (Including Installation) for Steam Electric Stations.

show the general situation. Note the effect on construction costs since the end of 1946, caused by increases in construction wages and building material prices. The cost of basic materials, commodities, equipment and services of all kinds follows the trend of wages, since labor is the dominant element in their overall cost. Likewise, the chart shows that the trend in construction cost follows the trend in wages, both rising and falling.

The construction cost index has been computed as a composite of general-construction cost data and in part takes into account factors of productivity of labor, efficiency of construction plant and management, mechanization and competitive conditions. The indexes make no allowance for overtime pay or premium prices paid on materials.

Neglecting the year-by-year movements, the curves show that the various indexes have moved upward from 1939 to June 1947 by the following approximate amounts; the labor index, 144 points; the material index, 149 points; and the resultant construction cost, 151 points. Of the 151-point increase in construction cost since 1939—a period of eight years, 60 per cent of this increase has occurred since January 1946 or 18 months before the end of the curve. Utility construction is influenced by the same forces which have caused this upward trend in general construction cost.

Material and Equipment Delivery Situation

In connection with our more immediate problem of utility construction, last November we made an exhaustive study of the more critical items affecting construction schedules. Within the last month we have again reviewed the delivery situation in respect to these items, with responsible representatives of the larger manufacturing companies. Fig. 2 shows the delivery schedules of the most critical items of equipment. The situation in heavy equipment for power plants is such that 42 months are required from time of authorization to completion of construction for steam-electric stations of 20,000-kw capacity or larger. The controlling factor continues to be delivery time of turbine-generators, which is about 38 months.

The next most critical item in getting a plant on the line is power transformers. Present shipment estimates are 34 months for transformers requiring design by the manufacturer, with this time reduced in some instances to about 24 to 30 months if manufacturer's design drawings at hand can be used. This is an increase of 4 months for both turbine-generators and transformer deliveries, over comparative promises of last November. This correspondingly lengthens the time for plant construction, thus contributing materially to higher construction costs.

Equipment Cost Trends

Fig. 3 shows the trend in cost of principal items of equipment for steam-electric stations, including installation cost. Price controls during the recent war maintained fairly stable price levels for this equipment during the period 1941 through 1944. Up to February 1946 the average cost of major equipment for a typical installation of medium capacity had risen less than 10 per cent above the 1939 figure. After February 1946, however, higher wages for both shop and erection labor, plus general price increases, produced sharp price rises, which by August 1947 resulted in average cost for this same equipment approximating 63 per cent higher than in 1939, and 50 per cent higher than February 1946. The spread of price rises in various equipment items since 1939 ranges from 30 per cent to 65 per cent. Increases in erection cost vary,

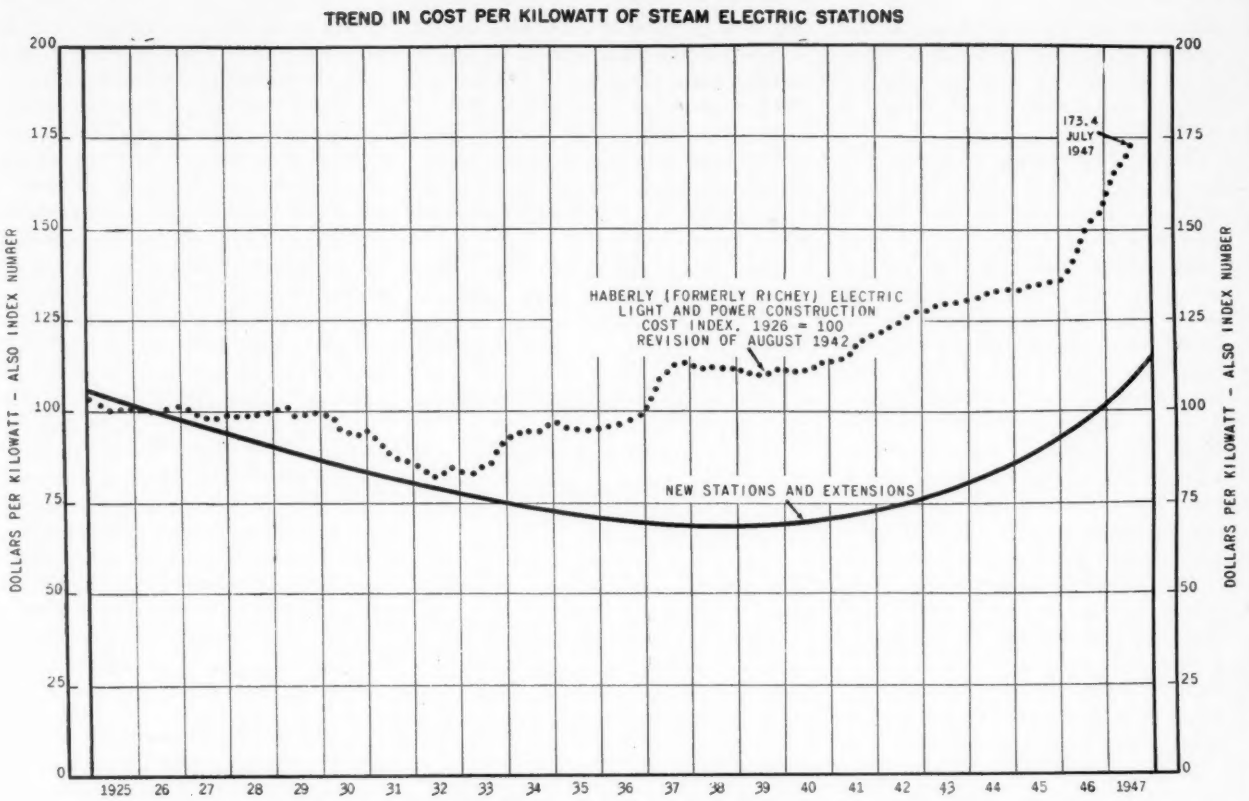

TREND IN COST PER KILOWATT OF STEAM ELECTRIC STATIONS
DOLLARS PER KILOWATT - ALSO INDEX NUMBER
200
175
150
125
100
75
50
25
0
1925 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 1947
173.4 JULY 1947
HABERLY (FORMERLY RICHEY) ELECTRIC LIGHT AND POWER CONSTRUCTION COST INDEX, 1926 = 100 REVISION OF AUGUST 1942
NEW STATIONS AND EXTENSIONS

Fig. 4—Trend in Cost Per Kilowatt of Steam Electric Stations Based on Ebasco Inc. Experience

The solid line in the chart represents plants ranging from 10 to 42 megawatts in size with one exception. The figures are exclusive of land, step-up transformers and switchyard. The curve is a composite of coal, oil and gas-fired plants and includes both new stations and extensions to existing plants. It is, however, decidedly influenced by the trend toward one-boiler one-turbine semi-outdoor construction, and by the low cost of gas or oil-fired stations as compared with coal-burning. The estimates for plants scheduled for completion in 1948-'49-'50 show a decidedly upward movement. The projection of the curve beyond 1947 (not shown on chart) using estimated expenditures indicates the probability that costs will move upward on a curve rising even more sharply than plotted for the last two years.

Estimates for new, larger-size developments, based on today's price levels, for gas or oil-fired semi-outdoor plants, are averaging about 11 per cent higher than at the end of the curve shown; for semi-outdoor coal-burning plants 57 per cent higher; for coal-burning plants fully enclosed with outside face brick, interior tile facing, tile floors and elaborate site developments, 74 per cent higher—approaching the figure of $200 per kilowatt.

being 100 per cent on some items and as high as 150 per cent on some piping.

Since price controls were removed, equipment costs have indicated the natural tendency to follow the trend of wages—there is every reason to believe that this tendency will continue in a free economy.

Steam Plant Cost

Fig. 4 shows the trend in cost per kilowatt of steam-electric stations, based on Ebasco experience. The plants range from 10 to 42 megawatts in size, with one exception. The figures are exclusive of land, step-up transformers and switchyard. The curve is a composite of coal, oil and gas-fired plants and includes both new stations and extensions to existing plants. It is, however, decidedly influenced by the trend toward one-boiler one-turbine semi-outdoor construction, and by the low cost of gas or oil-fired stations as compared with coal-burning. The estimates for plants scheduled for completion in 1948-'49-'50 show a decidedly upward movement. The projection of the curve beyond 1947 (not shown on chart), using estimated expenditures, indicates the probability that costs will move upward on a curve rising even more sharply than plotted for the last two years.

As an example of increased plant cost, two plants constructed in the middle west are cited. From date of authorization to completion of construction, the two periods are April 1941 to August 1943; and February 1945 to August 1947. These plants were of semi-outdoor type, on the same property, in the same general locality, using the same fuel, and equal in rated capacity, and both were new construction. The figures used do not include land and substation. The latter plant, completed in August 1947, shows an increase in price per kilowatt of 25 per cent over the former. The second of the two plants was not fully subjected to the steepest rise in costs which has taken place in the past year-and-a-half, since major equipment was bought before that period.

Estimates for new larger-size developments, based on today's price levels, for gas or oil-fired semi-outdoor plants, are averaging about 11 per cent higher than at the end of the curve shown; for semi-outdoor coal-burning plants 57 per cent higher; for coal burning plants fully enclosed with outside face brick, interior tile facing, tile floors and elaborate site developments, 74 per cent higher—approaching the figure of $200 per kilowatt.

Influence of Design on Cost

While reference is made herein to plant-design factors, there is no intention to indicate or establish what style of construction or items of equipment

should be adopted in designing a plant to meet any specific need. These factors are mentioned only as a reminder that design features have a marked effect on overall costs.

This is a time when, more than ever, construction programs should be planned on a coordinated and economic basis to meet actual needs for the next few years. This requires careful analysis, and balancing of transmission, distribution and power plant, for each major extension. Management should take an active interest and exert a strong influence in the interest of sound economic planning. There is sometimes a danger that plant design will become a composite of the wants and ideas of a number of individuals, many of which may call for non-essentials or be economically unsound in view of existing price levels.

The successful continuation of our form of economy may be dependent upon spreading available basic materials over a wide-spread need in the world today, both at home and abroad. We may gain manifold returns in the end by foregoing some refinements today.

The location of power plants has a decided effect upon the construction cost. The use of cooling towers for circulating water permits a wider range of site selection, which can reflect savings in site development. Distance from load centers, from fuel sources and from railroads and highways, may be better controlled than in the past, when a plant was generally located near the ocean, a lake or large river, to provide water supply for condensing purposes. Two new developments under construction have no railroad connection to plant site, although they are provided with good water transportation facilities. Not long ago it would have been considered foolhardy to design a power plant without a full-capacity turbine-room crane. We are now handling the heaviest pieces by improvised means from cars to pedestal location. They can be moved a few miles over a good road at relatively little cost, if it is economic to do so. With water transport, costly dock facilities seldom are necessary for receiving equipment during construction.

The use of cooling towers permits the building of circulating-water tunnels or running of pipes just below ground level, and the keeping of main building slab at ground level. This eliminates costly, deep and often wet construction. The availability of a well drained site with a good soil condition, not requiring bearing piles, is another important element in construction cost. Direct savings in reduced deep construction volume are further enhanced by indirect savings resulting from shorter construction schedule. These factors have a definite influence in controlling the kilowatt unit cost against the rising trend in prices of equipment and labor.

Power-plant development has shown a trend toward constructing the minimum in station building and housing structures, suitable for climatic conditions of location.

Building structures may be classified as:

Completely enclosed
With outdoor boilers
Semi-outdoor
Outdoor

Some "outdoor" stations now in design have a small two-story building alongside the turbine pedestal, which houses the control room and certain auxiliary pumps including the boiler-feed. A lean-to rain-hood serves as a shelter for the boiler operators. A small enclosure over the turbine may be on a track, which permits easy removal for maintenance purposes. A removable cover houses the exciter, but the generator casing is exposed to the weather. Auxiliary power switchgear is of the outdoor type. A gantry crane bears along the outer edge of the turbo-generator pedestal and moves parallel to the long axis over a tract extending beyond the pedestals, which permits handling parts to and from railroad cars. A modest service building removed from the noise and vibration provides space for office, stores, shops, locker rooms, cafeteria and other services at minimum cost for these requirements.

Outdoor station construction represents a tangible saving in direct building investment; the shorter construction period, and easier access to all phases of the construction from ground level with ordinary construction equipment, further reduce construction cost. Outdoor design, on the one-boiler one-turbine basis, with little duplication of any mechanical auxiliaries except provision of a spare boiler feed pump, offers considerable reduction in plant investment. Inter-connection of generating facilities makes possible this elimination of spare station auxiliaries. This idea may extend through the electrical facilities, for instance, by using one three-phase transformer, single-bus construction and simplified high-voltage switching equipment.

The rising plant costs during the past decade have been offset to a considerable extent by technological improvements in equipment, reduction in building volume, use of single auxiliaries and general simplification in design. However, during the next few years, chiefly because of the pressure on existing manufacturing plants, we cannot foresee the introduction of any important technological improvements in design which will have a marked effect in keeping kilowatt unit investment cost from increasing directly with increasing wage and material costs. Likewise, further reduction in building structures is practically at an end—as compared with the "stripped" plant described above. Some minor saving may be realized by placing the turbogenerator at main slab level, with side-outlet condensers alongside. If these limits obtain, as to simplification of design, and if the rise in prices should be sustained for any length of time, power-plant construction may show a sharper increase in cost than history has recorded.

Larger Generators

Size of turbogenerator unit installed may represent two to three years' load growth, or perhaps 10 per cent of system capacity. However, full consideration and benefits from interconnections with neighboring systems, and the pooling of facilities, may permit the selection of larger units installed at less frequent periods, thereby taking advantage of lowered per kilowatt cost and greater economy. Unprecedented demands for more power have, in several instances, required that unit sizes be increased 33 to 50 per cent above the last previously installed unit. Since a 50 per cent increase in capacity may reduce kilowatt unit investment cost in the order of 12 per cent, all factors should be carefully weighed to avoid making the error of selecting units of too small a size.

The advantages of the AIEE-ASME standard rated units, in sizes up to 60/66 megawatts, should not be overlooked. Lower kilowatt purchase price and reduction in unit cost of design and construction are some of the advantages to be gained.

Examples of Transmission-Line Erecting Costs

The increased cost of erecting transmission lines is illustrated by the two following specific examples.

One line located in the middle-west and started early in January 1941 but discontinued as a result of war condi-

tions, is now under construction. The cost of erecting a typical mile of line is now about 85 per cent higher than in January 1941. This comparison is based on the average of three low-bid prices, taken in January 1941 and July 1947 for erecting the lines, with materials furnished to the contractor. Contractor's labor and equipment rental rates increased approximately 27 per cent and 45 per cent, respectively, in the period between 1941 and 1947. This is a good example of the relation of overall advances in cost relative to the percentage increases of separate components. Allowances to attract and hold labor, overtime pay and reduced efficiency of labor are some of the principal items that competitive firm price bidders are including in estimates.

Since January 1941 transmission pole-line hardware and crossarm prices have increased approximately 40 per cent and 110 per cent, respectively.

Another transmission line case of two lines having comparable conditions may be of interest. These lines are located in the south-central area. One line was constructed in 1938—the other is now under construction. The lines are about 100 miles in length with point of power generation and terminal substation the same in each case. They do not parallel one another on the same right-of-way, but the country traversed is similar in general character. Based on the average of the three low-bid prices, the cost of erecting a typical mile of line is now approximately 230 per cent higher than in 1938.

In neither of the above cases were such items as right-of-way, surveying, clearing, etc., included in the comparisons.

Hydroelectric Plants

There have been relatively few installations of hydroelectric plants by private companies in the last decade, and these have been principally in the areas where steam-plant operating costs are high, because of remoteness from fuel sources. It is difficult to cite a definite trend in the cost of hydro plants, because each one is a custom-built job for a specific purpose and no two plants have the same features to make possible direct comparison. However, the same factors of construction cost which have resulted in a steadily increasing cost of steam power plants, affects the construction cost of hydro plants.

Manufacturers report a sharp increase of roughly 60 per cent in hydraulic-turbine equipment prices since 1939. Deliveries are ranging from 14 to 20 months as a result of material shortages and labor difficulties. It should be noted that certain electrical items, such as power transformers and high-voltage switchgear, involve substantially longer deliveries.

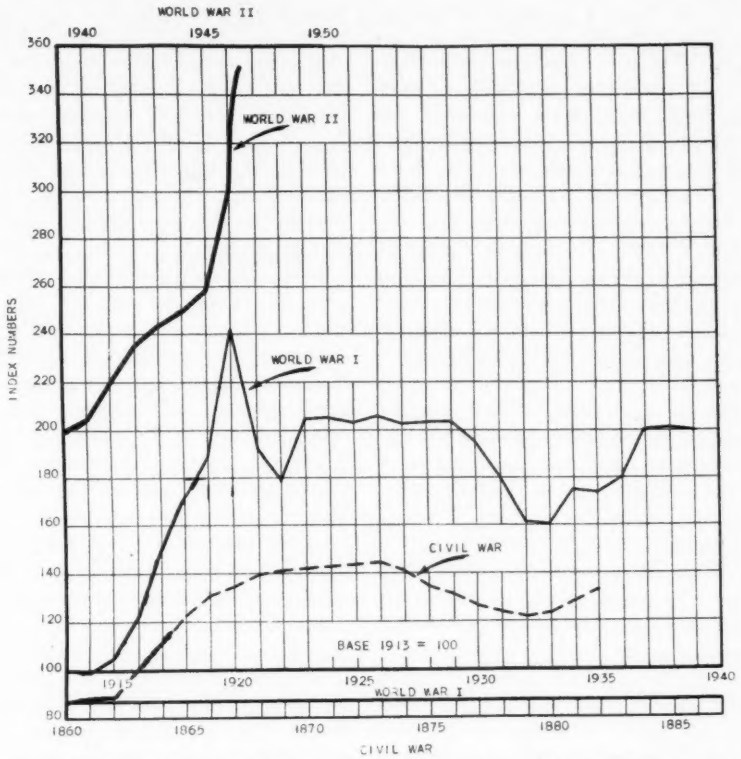


Fig. 5—The Effect of War on Construction Costs Before, During and After World Wars I and II; and on Wages in the Civil War Period.

Where there is a possible choice between hydro or steam plants, the situation may warrant thorough study to determine the economic choice, in view of the trend toward increasing kilowatt unit cost of steam plants.

Estimating and Cost Accounting

We have endeavored to show the rising trend in construction cost by specific examples and charts. However, do not be misled into thinking that the estimator turns to these average charts when estimating new steam-plant construction cost. The estimator is concerned with such factors as construction schedule, nature of site, location with respect to railroad and highway, ground-water conditions, soil bearing, steam pressure and temperature, station capacity, voltage, refinements in design, character of structures, construction methods, and many other items. Under today's fluid conditions he is looking to construction underway, for actual costs. What did equipment of a similar nature and capacity cost since the last price increase? What did structural steel erected, cost on a job last week or last month? What were yesterday's bid prices for a job just getting underway? It is necessary to look to yesterday's prices in order to estimate costs with any degree of accuracy.

It is axiomatic that in a period having a rising trend of prices—the longer the time from authorization to finish of construction work, the greater the increase in cost will be. Therefore, power-study estimates based on present-day prices must be at variance with actual costs, when current schedules for projects over 20,000 kw may well run 3½ years from time of study to completion of construction.

Construction-cost estimating is a factual work based on conditions known at the time that the estimate is made. This emphasizes the necessity for careful construction cost accounting. The field office must be alert to the importance of keeping accurate cost records of work completed. Cost reports should be prepared at periods having some relation to the size and duration of the project. In

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Courses Fit GI's for Utility Jobs

SOUND slide films, movies and similar visual aids are playing a significant part, along with theoretical and practical instruction, in the training of 110 veterans for jobs with the South Carolina Power Co., Charleston. Most of the training, which is being done under Public Law 346, is supervised-work experience. But several departments of the company have supplemented their schedules with visual aids and a library for trainees, which is also used by regular employees.

Sixteen apprentice courses—or "objectives"—all approved by the State Department of Education, are being given by the company. Six of these are in the electrical division, including: lineman, electrician, switchboard operator, appliance repairman, meter tester and serviceman. Non-apprenticeable courses are also given for relay testers and student electrical engineers.

Use of the educational films is coupled with general group discussion. Slide films used with explanations of functions of various mechanisms have been particularly helpful. Where practical, the sound slide films are followed by a physical disassembly of the unit, explanation of each part and its contribution to the functioning unit.

Worn or damaged parts are inserted in the mechanism to show how parts that need replacement interfere with operation. Attention is then drawn to losses that occur or to improper functioning of the unit. This method is particularly helpful to trainees in the appliance repair department. G. W. Moody, who is supervisor of the department, says that considerable time has been saved by this method of demonstrating the principles of refrigeration.

In the line department two training yards are being used, one at Charleston and the other at Walterboro. Trainees are instructed by their foremen in basic duties of a lineman, using explanation, demonstration, and practice. Training manuals have been distributed to supervisors and the plan is to have specialized instructors follow a prescribed program. Trainees who have been assigned to regular line crews after "graduation" have shown themselves capable of performing regular work with a minimum of instruction and supervision.

Trainees within various departments have taken advantage of texts and other literature accumulated by the company. While their use is not compulsory as part of the course, the company encourages use of them as well as of research material and other information provided.

Of prime importance, the training programs are giving the employee a theoretical foundation of subjects taught, and at the same time the practical "know how" of operations. Confidence and efficiency have been gained, as well as experience.

Trends in Construction Costs

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some cases this may well be each month and on larger projects not more than quarterly.

Future Construction Costs?

You are all interested in the sharp upward trend in prices and wages and the effect on the cost of improvements which you may have under consideration.

Fig. 5 has been prepared to show comparatively the response to economic pressures in the construction field just before, during and after the cessation of hostilities for the Civil War period, and for World Wars I and II.

There is a remarkable similarity in the timing of changes with respect to the beginning and ending of these conflicts. We are vitally interested in the future plateau levels of construction cost like those that lasted for several years following the Civil War and World War I. No one knows when the present upsurge of prices will reach its peak, but if history means anything, there will be a peak, a sharp reaction, with construction costs stabilized for a substantial period of time at a level above the pre-war level.

When the peak will occur is anyone's guess, and the level of stabilization is also in the same class. However, it is safe to say that the level of stabilization ultimately reached will be well above pre-war costs, and those who need power plants cannot gain much by wistfully thinking of the "good old days" of low construction costs.

Ebasco Holds 9th Annual Safety Meeting

SAFETY directors and operating executives of 20 client companies of Ebasco Services Inc., held their 9th annual Safety Meeting in Chicago, Illinois, during the week of Oct. 6-10 in conjunction with the National Safety Congress. Some 20 client companies operating electrical, gas, oil and transportation systems in the United States and Cuba were represented at this meeting which was held under the sponsorship of the Ebasco Insurance Department, I. M. Carpenter, Manager. W. T. Rogers, Ebasco Safety Consultant, was the General Chairman of the meetings which took place in the Congress Hotel. Invited guests included representatives of Commonwealth Edison Company, The Toledo Edison Company, the Hydro-electric Power Commission of Ontario, Hartford Electric Light Company, Niagara Hudson Power Corporation, American Telephone and Telegraph Company, the National Safety Council and the Edison Electric Institute and American Gas Association.

Roy Collins Slack

ROY COLLINS SLACK of Garden City, Long Island, N. Y., died suddenly in New York on Oct. 10. He had been continuously associated with the American Gas and Electric Company System since first entering its employ in July, 1925.

Mr. Slack began his career with the Appalachian Electric Power Co. in the Charleston General Meter Department, and later transferred to Atlantic City, New Jersey to assume the position of general meter superintendent of the Atlantic City Electric Co. Late in 1941 he became the manager of the Bridgeton Division of that Company.

In 1945 Mr. Slack was appointed to the position of Executive Engineer at the New York office of American Gas and Electric Service Corp. At the time of his death Mr. Slack was Budget Engineer of the System.

Farm Electrification Conference Examines Important Problems

Wiring, Equipment Design and Distribution, and Research Among Important Subjects Discussed; Conference Placed on Permanent Basis

THE Second National Farm Electrification Conference, held at the Claypool Hotel, Indianapolis, Ind., on October 7 and 8, attracted a capacity gathering of over 350 representatives of farmers' groups, agricultural colleges and schools, farm publications, equipment manufacturers, power companies and REA cooperatives.

With an announced objective of "bringing together everyone interested in raising farm living standards, and reducing costs by increasing the profitable uses of electricity on the farm," the Conference featured panel discussions of important farm electrification problems by groups of nationally known experts. The distribution and servicing of farm electrical equipment, farm wiring and re-wiring, education and in-service training of agricultural workers, and experimental work in developing electrical appliances for both farm and home use, were discussed by authorities in each field.

Hassil E. Schenck, President of the Indiana Farm Bureau, Inc., of Indianapolis, served as Chairman of the Conference, with George W. Kable, Editor of *Electricity on the Farm* magazine as Vice Chairman. Russell Gingles of the NEMA Farm Electrification Bureau was Secretary-Treasurer of the Conference.

The Conference was addressed by Claude R. Wickard, administrator, Rural Electrification Administration, Washington, D. C., who spoke on "A New Era in Agriculture;" L. M. Smith, vice president, Alabama Power Co., Birmingham, Ala., who described the agricultural development activities of power suppliers, and J. E. Stanford, executive secretary, Kentucky Farm Bureau Federation, Lexington, Ky., speaking on the topic, "The American Farmer Looks Ahead."

Plans for '48 Conference

Plans for the 1948 Conference got under way with the election of Frank E. Watts, of the *Farm Journal,* New York City, as the new Chairman. Other officers elected were C. D. Leiter, F. E. Myers & Bro. Co., Ashland, Ohio, as Vice Chairman, and Frank Innes, associate editor of *Electrical World,* Secretary-Treasurer. The 1948 meeting will be held in Chicago during the fall, and will be continued as an annual event.

Among the organizations participating in the Conference are the Agricultural Education Service; American Agricultural Editors Association; American Farm Bureau Federation; American Institute of Electrical Engineers; American Society of Agricultural Engineers; American Society of Mechanical Engineers; American Washer and Ironer Manufacturers' Association; Associated Business Papers, Inc.; Canadian Electrical Manufacturers' Association; Edison Electric Institute; Farm Equipment Wholesalers' Association; National Association Domestic and Farm Pumping Equipment and Allied Products Manufacturers; National Conference of Business Papers Editors; National Electrical Contractors' Association; National Electrical Manufacturers' Association; National Electrical Retailers' Association, and the National Electrical Wholesalers' Association.

Tuesday Morning Session

In behalf of the State of Indiana, Lt. Governor Richard T. James welcomed those attending the Conference to Indianapolis. He pointed out the great strides that have been made in farm electrification, and how it has become an important part of rural life.

Chairman Schenck, in his opening remarks, predicted that "we will see unveiled during the next decade more far-reaching and revolutionary farm practices, from the standpoint of efficient agriculture, than was achieved during the past 50 years. Electricity applied to the many difficult farm jobs and to the tasks of the farm home will go a long way towards contributing to a prosperous and stable agriculture."

Problems involved in the distribution and servicing of farm electrical equipment were examined in the first panel discussion, under the leadership of Hugh Curtis, managing editor, *Successful Farming,* Des Moines, Ia. On the platform were C. D. Leiter, F. E. Myers & Bro. Co., Ashland, Ohio; N. H. Callard, Westinghouse Electric Corp., East Pittsburgh, Pa.; J. A. Mahr, Indianapolis Power & Light Co.; Frank E. Watts, *Farm Journal,* New York City; D. E. Washburn, United Cooperatives, Inc., Alliance, Ohio; Ralph J. Brown, General Electric Supply Corp., Bridgeport, Conn.; Edwin J. Kendall, farmer, of Indianapolis; Dawson Womeldorff, Public Service Company of Northern Illinois, Chicago; Frank Innes, *Electrical World,* New York City, and W. L. Beard, Union Electric Shop, Newark, Ohio.

Adequate Farm Service Needs

It was agreed by the panel that, to do the best job for the farmer, equipment must be carefully selected, correctly installed and adequately serviced. Those entrusted with the task of selling, servicing and installing such equipment should be well informed and expertly trained. Farm dealers were advised to analyze their rural territory to ascertain the requirements of their customers —to understand the farmer's needs and problems, and to be familiar with the farm wiring system. Adequate wiring, it was emphasized, is necessary to permit electrical appliances to perform with maximum efficiency.

It was suggested that well-equipped farms be used as models, and that farmers be urged to see electrically-operated machinery in operation. Power suppliers were invited to become partners of farmers in business, seeing to it that rural customers receive satisfactory information about electrical equipment, and assisting them in formulating a tangible program for the future.

Panel members stressed the need for disseminating information about all electrical appliances, in order that tomorrow will find dealers well stocked with sufficient products and farmers educated to their use. Problems confronting dealers in their task of servicing farm equipment were listed as including inadequate wiring of farmsteads, inability to get suffi-

cient repair parts, lack of sufficient information about products offered for sale, and in some cases, unsatisfactory inspection of equipment at the factory.

The consensus of the group was that there are too few men selling the idea of farm electrification, and too few individuals in the field working with farmers to help them in solving their electrical problems.

Tuesday Afternoon Session

The second Conference session, with Truman E. Hienton, Head, Farm Electrification Division, USDA, Beltsville, Md., in the chair, featured an address on "Agricultural Development Activities by Power Suppliers," by L. M. Smith, vice president and director of public relations of the Alabama Power Co.

Suppliers of electric power to the farm have a continuing and direct interest in development of an improved agriculture in the area served, Mr. Smith declared. Such development work must be projected in terms of the service they can provide, he emphasized.

Assistance to agricultural agencies in carrying out their programs, cooperation in promoting worthwhile farm youth activities, aid in conducting soil conservation programs and demonstrations, and promotion of research on farm waste and the growth of crops for industrial uses, are among the methods now being employed by power companies to help build a better agriculture, Mr. Smith said.

"Surely we must not forget that America came to her greatness from her 'grass roots' and it is from the farms and small communities that much of our strength for greater national accomplishments must continue to come," Mr. Smith explained. "One of the most important reasons for power suppliers taking part in agricultural development activities of their communities is that they thereby will help keep the farm the birthplace of our national greatness."

The second group discussion, on farm wiring and re-wiring, was headed by J. R. Waters, of the Monongahela Power Co., Fairmont, W. Va. His panel included George C. Merkel, United Light and Railways Service Co., Davenport, Ia.; W. A. Cockran, Alabama Power Co., Birmingham, Ala.; Harold H. Beaty, Iowa State College, Ames, Ia.; H. E. Antle, Boone County REMC, Lebanon, Ind.; John W. Van Ness, contractor, of Valparaiso, Ind.; L. A. Walls, Monongahela Power Co., and R. B. Hicks, Southside Electric Cooperative, Crewe, Va.

Opening the session, Mr. Waters said that the objective of good farm wiring is to help the farmer to apply electricity productively, and that in this, the power supplier, extension service, contractor, distributor and manufacturer have a common interest. Coordination of the efforts of all these groups is essential to stimulate recognition of the need for good wiring, train personnel in this field, and see that a good job is done.

Many farmers think that the cost of good wiring is too high, and the contractor's plans too lavish, the panel agreed. Lack of knowledge is at the root of all wiring difficulties, Mr. Beaty said, pointing out that three major reasons for unsafe, inadequate wiring jobs are that farmers don't know they need good wiring; inspection of many farm wiring jobs is poor, and the workmanship is not up to high standards.

Education in farm wiring is best conducted through meetings of farmers' groups, films and slides, training programs for county agents and other agricultural workers, demonstration farms, 4-H club electrical projects, exhibits at county and state fairs, with continual efforts to help the electrical dealer and contractor. Mr. Van Ness urged the power supplier and contractor to agree on common wiring standards for urban and rural areas, declaring that at present many contractors will not solicit farm business due to the different definitions of adequacy.

The group agreed that "adequacy" in farm wiring is continually changing as new equipment is developed, and that the best standards of today will be considered hopelessly outmoded in the future.

Tuesday's session concluded with a dinner session at which J. E. Stanford, of the Kentucky Farm Bureau Federation, stressed the importance of farmers' organizations in helping agriculture to meet the uncertain years ahead.

Wednesday Morning Session

The third panel discussion, which dealt with "Farm and Home Uses, Experimental and Research Work and Unfilled Farm Electric Equipment Needs," was led by George A. Rietz, Manager of the Farm Industry Division of the General Electric Co. With Mr. Rietz were Ruth Gaffney, *Farm Journal*, New York City; Herbert Hartwig, a farmer of Denison, Ia.; H. J. Gallagher, Farm Service Supervisor of the Consumers Power Co., Jackson, Mich.; B. C. Reynolds, USDA, Washington; Hobart Creighton, a farmer of Warsaw, Ind.; Frank Andrew, Extension Service, University of Illinois; J. P. Schaenzer, Head, Electro-Agriculture Section, REA, Washington; S. T. Henry, assistant to the president, McGraw Hill Publishing Co., New York City, and Lucile Smith, *Capper's Farmer*, Topeka, Kan.

Among the points brought out during this discussion was the need for agreement among manufacturers of farm electric equipment on specifications, definitions, and testing and rating procedures. Far too many farm homes still use methods and practices which were common over 150 years ago, the panel agreed. These methods will not be modernized through high-pressure advertising and selling, it was pointed out, but rather through painstaking educational work by all agencies interested in raising farm living standards.

The varying needs of farmers for larger-size motors was covered at length, and the panel agreed that where such needs actually exist, it is the responsibility of the power supplier to meet them successfully. Farming as we now know it may possibly be revolutionized within the foreseeable future through agricultural research in such fields as supersonics, electronics and radio-activity, it was said.

Concluding Session

The Wednesday afternoon session was featured by an address by Claude R. Wickard, administrator of the Rural Electrification Administration. The possibilities that electricity holds for agriculture are enormous, Mr. Wickard asserted, but "full realization of these possibilities depends upon a number of factors, which should be given earnest consideration by every group which has the welfare of agriculture and of the Nation at heart," he continued.

The concluding panel discussion, entitled "Education and In-Service Training," was headed by Chairman J. H. McLeod, acting director of the Extension Service, University of Tennessee. Joining Mr. McLeod on the stand were Russell Gist, State Agent, Cooperative Extension Work, University of West Virginia, Morgantown, W. Va.; J. R. Cobb, Applications and Loans Division, REA; P. T. Montfort, Agricultural

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Transmission and Distribution Committee Meeting

T. J. Brosnan, *Chairman*

THE forty-fourth meeting of the Transmission and Distribution Committee was held on Oct. 9 and 10 at the Benjamin Franklin Hotel, Philadelphia, with 115 members and guests in attendance.

The morning of the first day was devoted to separate parallel sessions of the General Engineering, Underground and Standards and Specifications Groups for detailed round-table discussion of their respective problems.

The Chairman opened the general session by describing the organization of the committee for the present term and by outlining the program for the coming year, which will stress economy in construction and quality of service.

The Overhead Group sponsored by H. E. Stites covered a wide variety of subjects.

W. R. Weise described the design and construction of a 66-kv tower line to serve the Millcreek Barrier Dam Pump Station in Cincinnati. This line involved unusual problems due to the high degree of reliability required and the necessity for routing the line through the highly industrialized Millcreek Valley. The 7½-mile line traverses seven railroads, the Cincinnati Union Terminal and yards, adjacent freight yards, numerous industrial plants, bridges, including two double deck viaducts, and a city park. Reliability requirements necessitated the installation of low resistance grounds at each tower, the maze of tracks carrying rail traffic required stringing the conductors under tension and the close parallel with track circuits of the Cincinnati Union Terminal signal system and Western Union communciation circuits necessitated special measures to protect against inductive interference.

Economic Conductor Size

A. T. Green recalled that voltage drop rather than line loss has controlled the selection of conductor size for most distribution systems in the past. However, the present trend toward loading conductors and apparatus to a maximum and the greater use of voltage regulators have made losses a dominant factor. He stressed the necessity for including a charge for demand as well as energy in evaluating losses and presented sample curves for determining economic conductor size for residential and industrial feeders at various loads. These show that there is a certain range of sizes for each loading where annual charges do not change appreciably.

A novel device for right-of-way clearing was depicted in a movie presented by C. Swertfeger of Bushwhacker, Inc. The cutting mechanism consists of flails flexibly connected to a drum rotated at 750 rpm, mounted on a tractor. The machine handles up to 4 or 5 in. stock and shreds cuttings for disposal.

Split-Bolt and Compression Connectors

A report by R. M. Schahfer and W. H. Knutz describing the results of split-bolt and compression connector investigations was presented by Mr. Knutz. Extensive tests indicate that split-bolt connectors now on the market are unsuitable for use in a highly corrosive atmosphere when subjected to heavy short-circuit currents. Application of corrosive resistant compounds retarded increase in joint resistance but were not considered completely satisfactory. The cost of energy losses alone appears to justify the use of a lower resistance connection than that obtained with split-bolt connectors in corrosive atmospheres. End-to-end splice-type compression connectors were found satisfactory but more development appears necessary to produce a satisfactory T-type connector.

B. M. Gallaher summarized line damage in Florida resulting from the hurricane on Sept. 17. Although only a small amount of aerial cable was subjected to the storm it is of interest that no damage resulted.

L. R. Gaty reviewed developments in patrolling transmission lines by helicopter. Although equipment difficulties have been encountered in some cases a report from C. T. Malloy indicates a saving in patrolling the more inaccessible lines. Patrol of the 235-mile Boulder Dam-Los Angeles line was accomplished in 6 hours compared with 5 days for 2 men on the ground. A middlewestern utility reports that both suspension and pin-type insulators, structural features and conductors 300 MCM and larger can be inspected at 15 to 20 mph. However, it appears necessary to make separate flights for each conductor if detailed inspection of the wire is desired.

Reenergization of low-voltage networks was the subject of three papers presented by the General Engineering Group sponsored by L. G. Smith.

J. E. McCormack outlined start-up procedures developed for generating station, substation and district operations in New York City, both with and without means of intercommunication. He described operating experience with the procedure when the Hell Gate Generating Station was forced to shut down in 1938 with the resultant interruption of a 360 megawatt load. A load relief procedure developed since that time would have avoided interruption of 25 per cent of this load. H. M. Spooner described operating experiences with shutdowns on several networks of various sizes in New Jersey. Two shutdowns of the Newark network led to establishment of an alternate primary source of supply, rearrangement of the 4-kv bus to operate on occasion as 4 distinct groups and division of the network into halves connected at several points through fusible links to permit picking up the network in halves in the event of a shutdown at the beginning of the peak-load period. J. E. Goodwin described the network in Indianapolis and experience in restoration of service in the two complete shutdowns experienced during 18 years of operation.

Utilization Equipment Subcommittee

J. W. Anderson summarized activities of the Utilization Equipment Subcommittee. Progress is being made in the survey of company practices with regard to running over-current protection of 3-phase motors but more replies to the questionnaire are needed. Utilities report varied success in obtaining close cooperation with local dealer outlets in making correct motor applications for air conditioner customers. Concern has been expressed over the serious voltage disturbances caused by the high current requirements of one type of automatic washer. However, investigation reveals that the current has been materially reduced in later models so that a considerable reduction of complaints can be anticipated in the future.

A report from H. P. Seelye indicates that formulation of a final report of the EEI-NEMA Joint Committee on Preferred Voltage Ratings for A-C Systems and Equipment will soon be under way.

Progress in the joint use of facilities

for rural power and telephone service was reported by A. E. Silver. The EEI-Bell System joint subcommittee studying the power line carrier method of accomplishment has completed a draft in tentative form of a rural power line carrier agreement which has been distributed to members for review and comment. Final review and recommendation will await further experience and comment, meanwhile the tentative form will serve as a guide for dealing with specific cases. Experience to date bears out earlier expectation that the carrier method will be applicable in areas where telephones services are as sparse as 2 per mile or less. Joint use by power and telephone open-wire circuits on long-span construction still is the method of major promise. However, certain important items require further clarification before the EEI-Bell System joint subcommittee studying this method can reach accord in a statement of principles and practices.

L. G. Smith summarized the discussion at the separate session of the General Engineering Group which was devoted chiefly to orientation and discussion of problems warranting specific study. These included survey of high-voltage line outages, survey of experience with various types of construction and protection of distribution circuits, single-phase versus 3-phase regulation and bus versus feeder regulation.

Cost Reduction in Underground

Reduction of costs was the main theme of the Underground Group sponsored by J. A. Pulsford. C. T. Hatcher summarized discussion at the separate session of the group which was devoted entirely to this subject and emphasized that its importance is amplified by the increasing demand for underground construction. Materials represent roughly two-thirds of the cost and the industry must look to the manufacturers for reduction of this item. However, the remaining one-third can be controlled to some extent by system design and labor-saving procedures. Precast manholes, mechanical trench diggers, different types of conduit such as precast concrete and driving oversize pipe under important intersections are present day possibilities while flexible conduits available on reels, wood pulp-concrete ducts and simplified joints are future possibilities worthy of further investigation. A single pipe for primary, secondary and street lighting cables or installation of cable in gas mains was also suggested. The need for standardization of underground transformers was expressed and action was initiated to organize a group within the EEI-NEMA Joint Committee on Standards for Distribution Transformers to undertake this standardization.

E. F. Nuezel summarized the final report on 1945 cable operations. Preliminary data for 1946 indicates a marked increase in the cable failure rate which may be the result of overloading during the war.

A. H. Kidder and J. A. TenBrook discussed reasons for the installation of the several types of high-voltage cables used in Philadelphia. Mr. TenBrook described experience with the installation of the pipe cable system and emphasized the need for devising pipe type cables that can be installed during moderately inclement weather in order to avoid the present expensive delays waiting for clear weather.

Semi-Underground Distribution System

J. N. Gosinski described operating experience with a semi-underground distribution system installed in Evansville 10 years ago. The 4160-v radial primary system is installed in underground ducts while primary switching stations and transformers are located on platforms about 20 ft above the ground. Switching stations are connected to the underground primary system by cable risers and transformers are connected to switching stations by means of aerial cable. The secondary system is overhead cable. One primary cable failure has occurred and there has been an average of one fuse operation per year resulting in an average interruption of 45 minutes to a single block. The initial cost of this type system is low and experience has indicated an adequate service record as well as reasonably low operating costs.

G. B. McCabe presented a survey of wiping metal for cable joints. Binary alloys containing between 37.5 and 40 per cent tin are preferred by the majority of reporting companies and the consensus of those who have conducted tests indicates 38 per cent as the optimum. Over 70 per cent pressure test joints. The majority have adopted the fillet-type wipe, chill the wipes with stearine stick and glaze with torch and employ the same composition for sweating and wiping.

G. E. Fink described a truck especially designed to expedite and improve the quality of cleaning manholes and service boxes. The method consists of washing down and sluicing of the dirt and debris with water under pressure and then pumping the sludge into a specially constructed tank-type dump truck where baffles and screens are employed to settle out mud and solids and clean the water sufficiently for re-use.

The Standards and Specifications Group presented a review of its activities on behalf of sponsor F. W. Nimmer.

A. J. Beck described highlights of the material and equipment standardization program in Detroit (see page 403). Objectives of this program are effective classification, standard terminology, adequate specifications for purchase, minimizing the number of items purchased, coordination with nationally recognized standards and publication of a standards catalog containing both stock and non-stock items. He emphasized that standardization is a continuous process and that its success depends upon enlisting the participation and support of all departments.

G. H. Fiedler reported that generally favorable comments have been received from members on most of the proposed EEI-NEMA specifications for street lighting equipment.

Lightning Arrester Specifications

E. H. Kendall stated that the specification for a standard lightning arrester and cutout bracket has been sent to members for ballot. The specification for secondary racks is nearing completion and has been reduced to 4 types and 18 items. The question of lock nuts which has held up completion of the specification for steel insulator pins now has been settled. A source for manufacture of a standard wood and steel pin gauge is being investigated. Standard packaging is being studied jointly with the Purchasing and Stores Committee. An investigation of connectors is being organized.

R. M. Havourd summarized members' comments on the current draft of specifications for wet process porcelain insulators. Additional comments are needed regarding the number of samples to be taken for various tests and on the type of gauge and tolerance to be used for pin hole gauging.

F. A. Ashbaugh reviewed the current draft of a proposed ASA Wood Pole Specification which combines existing permanent and war standards in a new single permanent standard. He also viewed the salient features of the pro-

posed specifications for Douglas Fir crossarms which will soon be sent to members for ballot. It favors the use of preservative treatment, slightly relaxes defect requirements, promotes the use of chamfered top edges instead of complete roofing and recognizes crossarms with cross sections corresponding to standard lumber sizes.

L. M. Olmsted presented a progress report of the working group formed to analyze data collected on current fusing practices and recommendations. Standardization of fuse characteristics is the first objective of this program and current practice indicates the need for three types. Standardization of current ratings is the second requirement and a series of ratings with uniform ratios between adjacent sizes appears appropriate. This would result in fewer ratings while permitting one additional step in cascade fusing of long circuits.

A. E. Silver reported that material for the Fourth Report of the EEI-NEMA Joint Committee on Standards for Distribution Transformers is now well in hand and that its completion in tentative form is expected before the end of 1947. This report will include the Second and Third Reports thus comprising standardization coverage of overhead type distribution transformers, 500 kva and smaller, high voltages 15,000 v and below, low voltages 600 v and below, both single and 3 phase.

Electrical Equipment Committee Meeting

C. A. Corney, *Chairman*

THE regular Fall Meeting of the Electrical Equipment Committee was held at the Benjamin Franklin Hotel, Philadelphia, Pa., on October 6, 7 and 8. An attendance of over 80 members and guests attested to the interest in the program. The Philadelphia Electric Company was host to the Committee on the third day of the meeting during which the group was taken on a conducted tour of the company's Southwark Plant. Considerable interest was shown in the many features of this plant, especially the isolated bus construction, the use of metalclad switchgear, and dry type transformers for all indoor installations.

Closed Session

During the customary closed session of the Committee, F. S. Brown presented the Apparatus Trouble Report covering the period February 1947 to August 1947. The report covered 184 cases of trouble which is an average of 31 per month compared to a nine-year average of 22. Lightning contributed to 26 cases, or 14 per cent of the total. During the corresponding period last year, lightning contributed to 22 per cent of the total. Of the troubles classified as major, those occurring most frequently were Transformers (over 500 kva)—10, Oil Circuit Breakers—5, Generators (Hydro)—4, and Reactors —3. Of those classified as minor, the more frequent were Transformers (over 500 kva)—22, Induction Regulators—20, Transformers (500 kva and less)—17 and Motors—15. A detailed description of several of the cases of troubles were presented by members of the Committee. These were followed by a characteristically active round table discussion of the possible causes and methods of prevention.

H. K. Sels, Sponsor, Oil Fires, gave a report to the Committee on Oil Fires occurring during the period since the last meeting. Thirteen fires were reported resulting principally from Transformers, Circuit Breakers and Regulators.

E. B. Shew gave a report on the status of the "Guide for Specification of Metalclad Switchgear." He indicated that the guide was being considered by appropriate Committees of EEI, AEIC and NEMA with the view of issuance as a Joint Report.

R. L. Webb presented a paper outlining the experiences of the Consolidated Edison Company in testing generator insulation. Insulation resistance and dielectric tests are made immediately when a generator is removed from service or at least once every two years. Careful attention is given to the shape and magnitude of the dielectric absorption characteristics for indications of deterioration in the insulation. Several cases of incipient insulation failure have been detected through the application of the testing procedure. It was pointed out that the tests do not provide a foolproof means of detection of insulation failure prior to actual breakdown in service. However, the methods developed do provide a reasonably satisfactory means of checking insulation conditions for a majority of situations.

Open Session

J. A. Rawls reported the results of a survey of experiences with askarel-filled transformers and regulators, excluding transformers smaller than 100 kva and secondary network transformers. The questionnaire covered some 24 items of operating and maintenance equipment. Replies were received from 10 companies with a total of 200,000 kva of transformers and 3000 kva of regulators.

"Recent Changes in Substation Design" was the subject of a paper by R. N. Southgate which produced considerable discussion. The number of breakers used in the new design is less than in older designs, yet no hazard to reliability is incurred. The steelwork is standardized and fabricated to company's specification and can be erected in a minimum of time. A 27-kv primary loop supplying the stations can accommodate up to three substations. Protection for the transformers is provided by breakers on the 27-kv loop.

J. A. Rawls presented a discussion of "Power Factor Insulation Testing—Its Value to Utilities." Tests of insulation power factor have been made by his company since 1937. Over 12,000 such tests have been made at an average cost of $5.00 each. The cost is believed more than justified by the defects which were located and corrected before failure. Their experience indicates that the tests will detect moisture, dirt, carbon deposit, carbonization, corrosion, etc. Overstressed insulation or corona damage to generator windings are not detected by the tests. Efforts are made to have similar type of tests made on equipment at the factory and all equipment received is tested prior to placing in service.

"Reserve Capacity Determined by the Probability Method" was the subject of a comprehensive paper presented by G. Calabrese. The author reviewed the factors involved in the probability method and then described its application to his company's system. Outage data obtained from operating companies provided the basic quantity for the calculations. The limitations of the method were discussed and it was emphasized that the existence of limitations required judicious use of the results of probability calculations.

In addition to determining the degree of service reliability, the probability method was shown to be applicable to the evaluation of the relative reliability of various system arrangements such as the size and capacity of ties, interconnec-

tions with other systems, using common boiler headers, etc.

R. Brandt described the New England Electric System Interconnection Operation. Load control over extensive interconnections was based on flat frequency control for many years. Recently, deviation control was added which has been a definite improvement. Load swings are much less than formerly and this is of particular importance to the interconnected systems at this time. The flexibility provided with the present type of control is expected to make possible additional improvements in load control in the future.

"Generator Ratings and the Load Capabilities of Generating Plants and Systems" was the subject of a paper presented by J. H. Foote, which is reproduced on page 399 of this issue of the BULLETIN.

A sound-slide film entitled "Let's Figure It Out," prepared by the Boston Edison Company and Liberty Mutual Insurance Company, was presented. This film was based on the Five-Year Study of Fatal Accidents in the Electric Industry made by the EEI Accident Prevention Committee, and is designed for safety instruction.

W. R. Way gave a report on activities of the Canadian Electric Association of interest to the Committee. Abnormal load growth is also the predominant problem facing utilities in Canada and considerable additions to generating capacity are being made and planned. Agreement has been reached on standardized transformer bushings to cover ratings of 8.6 to 69 kv. Standard specifications for power transformers have been prepared and their adoption by the Canadian Standards Association is expected shortly.

A. V. DeBeech gave an interesting talk on "Meeting Load Growth in Brazil." The abnormal load growth taking place, coupled with the current delivery dates of equipment, has created a shortage of capacity. Estimates of future loads indicate that this situation may prevail for several years in spite of the installation of additional hydro capacity.

J. D. Swarin of the Industrial College of the Armed Forces mentioned that a series of lectures are being planned for various locations in the country as refresher courses for Reserve Officers. He extended an invitation to Utility engineers and executives to take part in these lectures when they are held in their localities.

Purchasing and Stores Committee Meeting

R. S. King, *Chairman*

THE Purchasing and Stores Committee's Fall 3-Day Meeting was held in Atlanta, Georgia, at the Henry Grady Hotel, September 29, 30 and October 1. The meeting was preceded by an Executive Committee Meeting on September 28.

Fifty-six Purchasing and Stores men attended. During the first two days, the reports of standing committees were read and discussed. The subjects reported were as follows:

Purchasing and Stores Record Committee—C. H. zurNieden, Philadelphia Electric Company, Chairman: Quantity Records used in operation of storeroom; Requisitions for procurement of equipment, materials and supplies (one time, repeating, etc.); Reports and analyses originated by Purchasing and Stores Departments; Assurance or insurance of service items, items that do not turn over but can be eliminated from materials and supplies account, how segregated, identified and reviewed for current status.

Stores Operations Committee—W. M. Holls, Consolidated Gas Electric Light and Power Company, Chairman: Replenishment of substoreroom stocks; Goodhousekeeping in stores operations.

Special Committee on Standard Description and Packing—G. E. Balch, Duquesne Light Company, Chairman: Report on committee progress to date relating to the standard packaging of line hardware.

Salvage Committee—R. L. Leach, Georgia Power Company, Chairman: Accumulation, Preparation, Grading and Sale of Scrap by small and large utilities.

Stores Buildings and Equipment Committee—T. W. Ayton, Indianapolis Power and Light Company, Chairman: The latest in Stores building and handling equipment.

Purchasing Operations Committee—H. L. Brewer, Consumers Power Company, Chairman: Purchasing material to E. E. I. standard specification; Training Purchasing Department personnel; Basing point pricing; Customers' relations and purchasing.

Mr. C. B. McManus, Vice-President of the Georgia Power Company spoke at the Luncheon Meeting on Monday. His talk was extremely instructive, in that he gave Management's views of both Purchasing and Stores responsibilities.

Mr. J. W. Knowlton, of the Duke Power Company, read and discussed at the Tuesday Luncheon, a paper on "How Far Before the Bottom is Reached," sending all home with something to think about.

On the morning of the third day, as guests of the Georgia Power Company, the members visited their Atlanta Warehouse and Pole Yard. Following this, committee members were luncheon guests of the Southern Wood Preserving Company. The luncheon was followed by an inspection tour of their Atlanta Plant. The hospitality of both the Georgia Power Company and Southern Wood Preserving Company contributed much to the success of this meeting.

The Spring Meeting of the Committee has been scheduled to meet in Cleveland, Ohio, in the latter part of April.

Electric Appliance Production Is Now Double Pre-War Level

WITH the exception of electric refrigerators, the production of electric appliances has greatly exceeded prewar levels, manufacturers' shipments during the first six months of 1947 having almost equalled the sales of the entire pre-war year of 1941. The following figures show the outlook for the principal items:

	Number of Units		*1947*	
	Pre-war, 1941	*1946*	*Actual Prod'n First Half*	*Estimate for Entire Year*
Refrigerators	3,500,000	2,100,000	1,376,000	3,000,000
Washers	1,892,435	2,000,000	1,770,000	3,500,000
Vacuum Cleaners	2,053,510	2,243,600	1,832,000	3,500,000
Electric Ironers	259,668	175,000	242,000	500,000

Indiana Electric Association Annual Convention

AT the Annual Convention of the Indiana Electric Association held in the French Lick Springs Hotel, French Lick, Indiana, on September 17, 18 and 19, C. K. Graham, Commercial Manager of the Southern Indiana Gas and Electric Co., Evansville, Ind., was elected Association President to serve through the coming year. He succeeds D. C. Hess, vice president of the Indianapolis Power and Light Co. J. G. Mooney, vice president and general manager of the Indiana and Michigan Electric Co., South Bend, Ind., was elected vice president of the Association and E. F. Hauser, Indianapolis, was re-elected Secretary-Treasurer.

In his opening remarks President D. C. Hess called attention to several important problems facing the electric industry. He particularly referred to the necessity of providing an adequate power supply and the sharply increased cost affecting both the construction and operating phase of the business. Included in the program for the opening session were reports by Association officers and discussions by E. S. Fields, vice president of the Cincinnati Gas & Electric Co., and Frank M. Wilkes, president of the Southwestern Gas & Electric Co. Mr. Fields reviewed the work being done by the Committee for Co-ordination of Power Supply, Indiana Area, to assure an adequate supply of electric power for the general consuming public in Indiana and neighboring states. Mr. Wilkes graphically called attention to the activities of the advocates of public power as they could affect the electric industry, dealing particularly with the area located in the southwest.

Opening the second business session on Sept. 18, H. K. Breckenridge, vice president of the West Penn Power Co., discussed developments in the labor situation as they exist today. Charles E. Oakes, president of the Pennsylvania Power and Light Co. and the EEI, followed with an address under the topic "The Road Ahead." He pointed out steps being taken by the electric industry to expand facilities used in providing necessary electric service and also called attention to the importance for electric companies to participate in all programs having the welfare of the general public at heart on a local level. Dr. Howard R. Bowen, Dean, College of Commerce, University of Illinois, presented an interesting and instructive paper on the national economy. Dean A. A. Potter of the School of Engineering, Purdue University closed this session by stressing the need for a broader fundamental education of our young people if we expect them to become sound citizens and believers in our free enterprise system.

At the closing business session Ashton B. Collins of Reddy Kilowatt service stressed the necessity for the electric industry to tell its story, repeatedly, emphasizing that we must believe in the industry. Frank C. Lyons, director of public relations, Dayton Division, General Motors Corporation, closed the Convention with an inspiring address under the subject "Three R's in the School of Citizenship" especially emphasizing the need for all citizens to fully accept their responsibility under our form of government.

At the Annual Banquet held in the evening of Sept. 18, the group was entertained by the Westinghouse Quartette from East Pittsburgh and by Strickland Gillilan, nationally famous humorist.

Association President D. C. Hess acted as presiding officer at the first business session, at the banquet and the last session with Vice President C. K. Graham presiding at the second session.

Special programs for the ladies attending the Convention had been arranged. The outstanding feature was a musical presented out of doors in the beautiful Japanese Gardens surrounding the hotel.

New Monthly for Rural Customers of United Light & Railways System

MIDWEST farmers this month pulled an attractive 16-page monthly from RFD mailboxes. The United Light and Railways Service Company, Kansas City, Mo., publisher, with neighborly interest set out to "localize our news by printing stories about farmers right in our own community" and to promote a better understanding of electricity on the farm.

Electrified Farming will be circulated to the 32,000 rural customers of the six United Light System operating companies in Iowa, Kansas, Missouri and Illinois. Behind a lively format, the magazine prints informative, practical articles on farm use of electricity drawn from actual "case history" experiences of farmers in the midwest area. Profitable ideas of Farmer Folkama of Mason City, Iowa or Farmer Sinn, Fort Scott, Kansas emphasize the uses of electric farm appliances. Household hints and recipes, and items of interest to the scientific farmer add to the family affair effect achieved by the personal interview technique of the copy and informal, on-the-spot photographs.

The new magazine, edited by Dean Sims of the United Light System's advertising and publicity staff, is the product of that organization's Agricultural Promotion Department, under the general direction of George C. Merkel, Director of Agricultural Promotion for the Service Company. Each issue will be localized for each of the six operating companies by using the inside front cover to publicize a message and photograph of the company's rural supervisor for each area. The back-cover advertisement will carry the signature of the company, and the publication will be mailed from the headquarters city of each company.

The operating companies of United Light System engaged in this new publishing enterprise are the Eastern Kansas Utilities, Inc., Iowa-Illinois Gas & Electric Co., Iowa Power & Light Co., Kansas City Power & Light Co., People's Gas & Electric Co., and the St. Joseph Light & Power Co.

Robert W. Hoy

ROBERT W. HOY, 78, who retired in 1941 as advertising consultant of Pennsylvania Power & Light Company, Allentown, Pa., died Oct. 17 in his home at Allentown.

He was a veteran of 60 years' service in the electric industry, beginning his career at the age of 13 as a telephone operator. He joined the Harrisburg (Pa.) Electric Light Company as a lineman in 1888, and since that time has been associated with the electric light and power industry in the operating, sales and advertising field. He joined PP&L in 1920.

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TD-10—Suggestions for Specification for Rolled Steel Washers (5/40)..	.10	.10
TD-12—Specifications for Pole Guards, 1946	.10	.10
TD-15—Specifications for Pole and Lower Steps, 1946	.10	.10
TD-51—Suggestions for Specifications for Low and Medium Voltage Fin-Type Lime-Glass Insulators (2/43)	.25	.25
TD-61—Suggestions for Specifications for Type "A" Untreated Douglas Fir Crossarms (11/40).....	.10	.10
TD-62—Suggestions for Specifications for Type "B" Untreated Douglas Fir Crossarms (11/40)	.10	.10
TD-71—Suggestions for Specifications for Insulator and Pin Threads and Gauges (5/37)	.10	.10

General Commercial Committees

	Members	Non-Members
Agriculture		
In-Service Training Program For Agricultural Workers	1.50	1.50
Farm Electrification Manual	5.00	8.00
Suggestions on Agricultural Development for Electric Companies	3.50	3.50
General		
P-6—The Heat Pump (7/47).....	.25	.25
F-5—A Guide for the Selection of Sales Personnel	.75	.75
Analysis and Development of Commercial Market	.50	1.00
Directory of Manufacturing of Commercial and Small Industrial Equipment (6/46)	1.00	1.50
O-16—Position Descriptions for Eight Utility Sales Jobs (12/46)	.35	.35
O-6—Commercial Refrigeration, 1946	.25	.25
O-3—Sales Personnel Practices of Utility Commercial Sales Departments, 1946	.40	1.00
O-1—Salesmen's Reminder, 1946	.25	.25
M-11—Report of Sales Personnel Committee (10/45)	.35	.35
M-14—Home Service Suggestions for organizing and operating Home Service Departments of Electric Companies	.40	1.00
Lighting		
O-9—Utility Home Lighting Promotion, 1946	.40	.40
O-8—A Comparison of Conventional Hot Cathode and Cold Cathode Tubing Fluorescent Light Sources, 1946	.25	.25
Postwar Planning		
Section II—An Appraisal of Our Competition		.50
Section III—Rural Electrification		.25
Section IV—Industrial Power Markets..		.25
Section V—Market Problems in Residential Field		.50
Section VI—Postwar Lighting Markets..		.50
Power		
G-4—Electric Metal-Melting Furnaces (1/40) $0.80		$2.00
F-11—Electrification of Oil Refineries (10/38)	.30	.75
C-13—Steam and Electrical Requirements of Hotels (12/35)	.30	(members only)
C-2—Steam and Electrical Requirements of Office Building (4/35)...	.30	.75
Water Heating		
"Self-Mailers to Dealers".....$1.50 per 100		
"Self-Mailers to Customers" (minimum lots 1,000) .....15.00 per 1000		
"Stuffers" in sets of 6 pieces (minimum lots 1,000) .....15.00 per 1000 sets		
"Eight-page folders" (minimum lots 1,000) .....12.50 per 1000		
P-3—Electric Water Heater Installation Manual—Section I	.50	.50
O-4—Model Specifications for the Installation of Wiring and Plumbing for Automatic Electric Storage Water Heaters	.25	.25
1-5 Standardization of Electric Water Heating Equipment (10/41)	.20	.50

National Educational Programs

Commercial Cooking		
The "Penny" Folder—"Invest One Cent in Electricity" .....$4.00 per 100		
O-7—Commercial Electric Cooking and Baking Manual (9/46)	.75	1.85
Commercial Cooking Survey, 1942....	.25	.25
Domestic Cooking		
Meals Go Modern Electrically .... (Special prices in quantity)	.50	.50
Electric Kitchens		
How To Make It Happen in Your Kitchen .....$2.25 per 100		
How to Plan a Modern All-Electric Kitchen .....$2.00 per 100		
The Principles of Kitchen Planning	.25	25
Electric Kitchen Films		
"It Happened In The Kitchen" (In Technicolor)		$225.00
Electrical Living		
Electrical Living Brochure	.25	
Peek Into Your Electrical Living Home	.04	
Live Electrically	.25	

	Members	Non-Members
Lighting Booklets		
Light Is What You Make It.....$5.00 per 100		
Better Light—Better Sight—Better Production .....$1.50 per 100		
Better Light—Better Sight—Better Living .....$1.50 per 100		
Better Light—Better Sight—Better Sales .....$1.50 per 100		
Priceless Eyes ..... 4.50 per 100		
Lighting Films		
"10 Charts For Use With Disney Film"		$15.00
"Light Is What You Make It"—A sound movie in technicolor, produced by Disney Productions, 16 mm., 10 minutes		Price Upon Request
"Let There Be Light" (Street Lighting sound slide film, 15 minutes, 75 frames $25.00		$25.00
"See For Yourself" (Home Lighting) sound slide film, 15 minutes, 105 frames $30.00		$30.00
Planned Lighting Program		
Stores, Schools, Offices, Industrial, Homes—(A group of promotional publications on above)		Price List Upon Request
Sales Training Course		
Basic Sets of 8 Films and Records....	Set	$200.00
Basic Sets of 8 Salesmen's Manuals...	Set	5.00
Residential Sets of 4 Films & Records.	Set	100.00
Residential Sets of 4 Salesmen's Manuals	Set	7.50
Commercial Sets of 4 Films & Records	Set	100.00
Commercial Sets of 4 Salesmen's Manuals	Set	4.00
Rural Sets of 2 Films & Records.....	Set	50.00
Rural Sets of 2 Salesmen's Manuals..	Set	1.00
Industrial Sales Training Handbook...		18.50
Wiring		
M-8—Handbook of Farmstead Wiring Design	.40	.40
M-7—Handbook of Residential Wiring Design	.25	.25
Rewiring for Commercial and Industrial Buildings	.25	.25
Basic Factors of Adequate Wiring—1939	.25	.25
Covered Neutral Cable Helps Sell Adequate Home Wiring—1939	.25	.25
Commercial Building Rewiring Market—1939	.35	.35
(Price on above three books as a group is 60c per set)		
Wiring Films		
Commercial Re-wiring—lantern slides, with lectures	Set	$25.00
Home Wiring—lantern slides, with lectures	Set	$25.00

Miscellaneous, Reference Books, etc.

M-13—Specifications for Impregnated Paper-Insulated Lead Covered Cable, "Solid" Type, "Oil-Filled" Type	Single copies	$1.00	
	10 or more "	.85	
Code for Electricity Meters (1941)..$1.60		$2.00	
Good Radio Reception (1937)....	100 copies	4.00	
	1000 "	25.00	
	3000 "	60.00	
	5000 "	95.00	
Objective Type Rates, 1933-1936....	.80	2.00	
Ice and Wind Loading Tables for Overhead Line Conductors (Revision of Tables 85 to 96 of the Overhead System Reference Book) 1942	1-4 copies 10c. 5-49 " 6c.		
Power Sales Manual, plus Sec. 12, 13, 14, 15, 16 & 17, Supplements to Sections 3 and 13	Price Upon Request		
Rate Book for 1947 .....10.00		25.00	
Storm Loading and Strength of Wood Pole Lines and a Study of Wind Gusts (1936)	2.00	5.00	
Weekly, Monthly and Annual Statistics	2.00	2.00	
(Includes Annual Statistical Bulletin; Weekly Electric Power Output; Monthly Electrical Research Statistics)			

Periodicals

Better Light—Better Sight News (6 issues yearly)	1.00	1.00
Edison Electric Institute Bulletin (Monthly)	2.00	2.00
Farm Electrification (a bi-monthly publication) Up to 10 copies.....	Free	
Over 10 copies	.50	1.00
Discount for orders of 25 or more..	25%	

PERSONALS

L. F. CHAMBERS of Chicago has been elected vice president and treasurer of the Northern States Power Company of Minnesota.

Mr. Chambers was chosen to fill the vacancy caused by the recent advancement of Bernard F. Braheney to the position of president and general manager of the Company.

CYRUS ERICKSON, Minneapolis, was named counsel for Northern States succeeding the late A. William Groth.

Mr. Chambers is a Minnesota man having been born at Waseca and raised at Mankato. He was graduated from high school there in 1911 and from the Mankato Commercial College in 1912. He then entered the service of the Northern States as a construction clerk in the Mankato Division. In 1923 he was promoted to the position of general accountant with headquarters at Minneapolis. In 1926 he joined the Public Utility Engineering and Service Corporation, Chicago, and he was vice president in charge of the finance and accounts department of that company, which position he now relinquishes to return to Northern States. He will take office November 1. He is married and has two children.

Mr. Erickson is also a product of Minnesota having been born and raised at Clinton, Minnesota. He is a graduate of Carleton College and of the Harvard University Law School. After having been admitted to the bar in 1924, he entered private law practice at Minneapolis. In 1926 he joined the Northern States Law Department. He was assistant counsel when promoted to his new position of counsel which is effective immediately. Mr. Erickson is married and has one child.

GUSTAV F. WATTERS, assistant vice president of Buffalo Niagara Electric Corp., Buffalo, has been elected executive vice president and a director of the Niagara Falls Power Co. Mr. Watters will have complete charge of all the activities of the company. No action was taken on a successor to President Paul A. Schoellkopf, who died in September of this year.

Resident Manager Wilfred C. Stephens, Buffalo Niagara Electric Corp., will remain in Niagara Falls.

Mr. Watters began his utility career in 1935 at Buffalo in the appliance service department, and from 1935 to 1939 was located in Olean where he gained a broad background of experience in the operations of the company, working in the line department, substations, distribution planning and rural extension departments. In 1939 he was transferred to the commercial sales department in Buffalo in charge of commercial electric cooking, and in 1940 became assistant to the vice president of the Niagara, Lockport & Ontario Power Company, now merged with Buffalo Niagara Electric Corporation.

In 1942, Mr. Watters enlisted in the Ordnance Department of the U. S. Army. He was discharged in 1945 with the rank of major.

JAMES W. ASMANN, senior operating engineer of the Cincinnati Gas & Electric Company, has been appointed assistant superintendent of electric operation. Mr. Asmann started with the company in substation maintenance work in 1927. After serving in various engineering capacities, he was made operating engineer of the company in 1939.

J. O. LANG has been appointed supervisor of the testing department of the Dayton (Ohio) Power and Light Company. Mr. Lang will be in charge not only of departmental personnel, but will have direct supervision of the testing of all electrical equipment in generating stations and substations. He first became identified with the company in 1919.

LEWIS A. LEWIS, division manager of the Washington Water Power Co. at Spokane, Wash., and assistant general manager of the company, has retired after 39 years with the company, during which time he actively participated in bringing about the development and widespread use of electric power.

Mr. Lewis started with Washington Water Power as a mechanic at the Ross Park steam plant in 1906 and soon thereafter was transferred to the sales department when the company launched a porch-street-lighting campaign.

From 1923 to 1946 Mr. Lewis headed the national electric range survey committee, comprised of electric range experts from Spokane, Seattle, Wash., and Boise, Idaho. A report published by Mr. Lewis, with special attention directed to power distributors, became the genesis of the electric range industry.

In 1910, Mr. Lewis became a member of the National Electric Light Association and in 1925 was elected its president. He was appointed assistant general manager of Washington Water Power's Spokane office in 1929 and to the board of directors in 1934. He was named Spokane division manager in 1939.

JOSEPH W. KLING has been appointed advertising manager of the Georgia Power Co., Atlanta, succeeding JOHN R. MARSH, who has been on leave of absence due to illness for the past 20 months. Mr. Kling has been serving as acting manager since last December. He joined Georgia Power in 1930. Mr. Marsh first joined the company in 1922, returned to newspaper work but rejoined the company in 1924 and soon afterwards was named assistant advertising manager and manager in 1930. He will serve as advertising consultant.

C. K. GRAHAM, commercial manager of the Southern Indiana Gas and Electric Company, Evansville, was elected president of the Indiana Electric Association at the recent meeting at French Lick.

Mr. Graham obtained his early experience with the Springfield Light, Heat and Power Co. at Springfield, Ohio, now a part of Ohio Edison Co., as meter tester, trouble shooter, lighting and power engineer.

In 1930 he was transferred to the Southern Indiana Gas & Electric Co. and at the present time is in charge of commercial and sales activities.

JAMES WILSON, president of the Shawinigan Water and Power Company, Montreal, has been elected chairman of the company's executive committee, succeeding the late Gordon W. MacDougall.

HAROLD F. SCHNURLE of Portland, Me., has been elected a vice president of the Central Maine Power Company. He will direct the utility's public relations program and represent it in some of its industrial development activities. He joined the company in 1936 and has since served as assistant to the president.

Mr. Schnurle has been a state senator and served two terms as a governor's councillor. For eight years he was chairman of the Maine Development Commission and he has been chairman of the Maine Division of the New England Council.

Heading organization changes recently announced by the Columbus & Southern Ohio Electric Company, Columbus, Ohio, is the appointment of FRANK H. STREIT to the position of chief engineer.

FRED CAMPBELL has been named assistant chief engineer.

The distribution department of the Columbus area has been consolidated with and will operate as a division of the engineering department. CHARLES H. STUMP will head this division and serve as district engineer.

Engineering offices of the southern area will also be consolidated with and operate as a division of the engineering department, with headquarters at Athens, Ohio. LELAND KRIEG will head this engineering division and serve in the capacity of district engineer.

WALTER A. SMITH has been appointed plant superintendent of the Floodwood generating plant, succeeding W. H. Badger, retired. T. A. MAY has been appointed superintendent of the new construction and maintenance department of the southern district with headquarters at Middleport.

Mr. Streit has been chief design engineer of the company for almost a year, and Mr. Campbell assistant design engineer during the same period.

C. D. GRADY has been appointed assistant superintendent, electrical department, Union Electric Co., at St. Louis. In his new capacity he will assist the electrical department superintendent in the operations of the line, substations, meter and engineering departments at East St. Louis and Alton. Mr. Grady has been with the company since 1921. At the time of his recent promotion he held the title of construction engineer.

C. W. BROOKS, assistant superintendent of real estate for West Penn Power Company, has retired from the organization after more than 46 years with the West Penn System. Mr. Brooks is the oldest active Power Company employee in length of service.

CHARLES H. ADAMS, chief clerk of right-of-way, and RALPH H. MILLER, assistant to R. M. Evans, superintendent of real estate, are appointed assistant real estate superintendents, following Mr. Brooks' retirement.

Mr. Brooks has been connected with the West Penn System since the early days of its organization. He was employed as trainman for West Penn Railways in June 1901, and transferred to the Power Company in January 1911. Active in real estate and right-of-way work for 25 years, he has served as assistant superintendent of real estate for over 15 years.

CHARLES H. ADAMS, a 25-year West Penn veteran, and chief clerk of right-of-way since January 1939, who was named assistant superintendent of real estate, will take over the duties of Mr. Brooks. He is a World War II veteran, and served two years with the U. S. Navy.

Also appointed an assistant superintendent of real estate was RALPH H. MILLER, who came with West Penn in June 1929 as a field man. He later worked as engineer, district solicitor and clerk at New Kensington, and has been located at Pittsburgh since April, 1939. Before joining the Real Estate Department last May, Mr. Miller was supervisor of rural line development.

HAROLD F. WEBB of Pittsburgh, general safety director of the West Penn System and the American Water Works and Electric Company, Inc., was elected president of the Veterans of Safety at their annual meeting in connection with the National Safety Congress in Chicago, the week of October 6.

Mr. Webb is a charter member of the Veterans of Safety. He has been engaged in safety engineering work for 32 years, and associated with the American System for the past 24 years.

The Veterans of Safety, organized in Chicago in October 1941, has a membership of 650 men who have been consistently and actively engaged in various phases of safety work for 15 or more years. They assist the National Safety Council and its sections, and other groups having safety as an activity, in solving new problems as they arise, and stand ready to help carry the benefits of organized safety to millions of Americans who have not yet enjoyed them. They also assist collectively and individually schools of engineering, trade schools and other places of learning in the preparation and teaching of text designed to prepare students for the profession of safety engineering.

A Philadelphia Electric Company employee, S. W. RUBENSTEIN, was elected executive secretary and a director of the National Association of Suggestion Systems at the annual convention of the group held at Chicago.

One hundred sixty of the nation's largest industries were represented at the conference of the organization which promotes employee suggestion activities in the member companies.

F. A. DENZ, of the Remington Rand Corporation, was elected president. Others elected to office were: A. J. ALGER, Firestone Rubber & Tire Company, vice president, and C. A. GUETAHL, of Abbott Laboratories, treasurer.

The Philadelphia Electric Company inaugurated its employee suggestion system more than thirty years ago, and rewards employees making suggestions which possess unusual merit.

Home Planning Booklet Issued by Electrical Living Committee

(*Continued from page* 402)

sirable ways to use electricity for better living," M. E. Skinner, Chairman of the Electrical Living Committee, said.

"Planning Your Home For Better Living—Electrically" is available at the Electrical Living Committee, 420 Lexington Ave., New York 17, N. Y., at 25 cents per single copy. Quantity prices are available on request.

Simulated Federal Income Tax Return

There are now available at Edison Electric Institute headquarters copies of a "Simulated Federal Income Tax Return (Including Supplementary Depreciation Schedules)" of a hypothetical "Elgas Company (on Behalf of Itself and its Affiliated Companies)."

This return, prepared for the Taxation Accounting Committees of the EEI and the AGA consists of 100 pages, including introduction and narrative description, as well as a complete set of schedules, and illustrates most of the methods and procedures necessary in compiling a utility federal income tax return.

$1.00 a copy

EEI Committees—

(*Continued from page* 394)

poration, Syracuse, N. Y., and vice chairman, J. R. Weger, Consolidated Gas Electric Light and Power Company of Baltimore. It will continue its highly successful program of informal meetings and exchange of view among its own members and those of the corresponding committee of the American Gas Association. During the past year the committee inaugurated the policy of issuing from time to time for the information of utility accounting officers, bulletins dealing with recent rulings and decisions as well as with moot questions of law and tax administration which were thought to be of broader interest than the purely technical aspects of tax accounting. This policy will be continued. A special subcommittee will be appointed to act as a clearing house for information and coordination of effort by member companies of the Institute to rid themselves of the grossly discriminatory and administratively costly Federal Electrical Energy Tax.

Farm Electrification Conference Examines Important Problems

(*Continued from page* 418)

Engineering Dept., Texas A. & M. College; J. B. Stere, Agricultural Engineer, West Penn Power Co., Pittsburgh, Pa.; C. E. Rhoad, Department of Agricultural Education, Ohio State University, Columbus, Ohio, and G. E. Henderson, Chief, Agricultural Engineering Division, TVA.

Progress in farm electrification will depend largely upon the success with which knowledge of electrical equipment for farm use is brought to the county agent, extension service workers and other agricultural personnel, it was stated during the discussion. It was agreed that the support of power suppliers, manufacturers and other interests concerned with advancing farm electrification is most important in programs designed to give agricultural workers training in modern electrical farm equipment. With little argument, it was agreed that the job of in-service training is much too big for the comparatively few agencies that are now trying to handle it.

CONVENTIONS AND MEETINGS

1947

NOVEMBER

3-7	International Lighting Exposition, Stevens Hotel, Chicago, Ill.
12-13	Southeastern Electric Exchange, Fall Convention, Hotel Roosevelt, New Orleans, La.
13-14	Pennsylvania Electric Association, Communications Committee, Lord Baltimore Hotel, Baltimore, Md.
18-19	AGA Motor Vehicle Committee and EEI Transportation Committee, Hotel Pennsylvania, New York, N. Y.
19-21	Joint Convention of Gas & Electric Sections, Commercial & Technical Divisions, Wisconsin Utilities Association, Schroeder Hotel, Milwaukee, Wis.
21-22	New Jersey Utilities Association, Seaview Country Club, Absecon, N. J.

DECEMBER

1-2	Prime Movers Committee, EEI, Hotel Traymore, Atlantic City, N. J.
1-5	The American Society of Mechanical Engineers, Chalfonte Haddon Hall, Atlantic City, N. J.
3-5	52nd Annual Congress of American Industry, National Association of Manufacturers, Waldorf-Astoria Hotel, New York, N. Y.
11-12	Pennsylvania Electric Association, Meter Committee, Benjamin Franklin Hotel, Philadelphia, Pa.

1948

JANUARY

26-30	American Institute of Electrical Engineers, Pittsburgh, Pa.

FEBRUARY

5-6	Missouri Valley Electric Association, Power Sales Conference, President Hotel, Kansas City, Mo.
9-10	Transmission and Distribution Committee, EEI, New Jefferson Hotel, St. Louis, Mo.
9-11	Meter and Service Committee, EEI, Biltmore Hotel, Oklahoma City, Okla.
12-13	Electrical Equipment Committee, EEI, Netherland Plaza Hotel, Cincinnati, Ohio.
16-17	Accident Prevention Committee, EEI, Roosevelt Hotel, Pittsburgh, Pa.

MARCH

14-18	National Electrical Manufacturers Association, Edgewater Beach Hotel, Chicago, Ill.

APRIL

6-8	Fourteenth Annual Sales Conference, EEI, Edgewater Beach Hotel, Chicago, Ill.
7-9	Missouri Valley Electric Association, Engineering Conference, President Hotel, Kansas City, Mo.
8-10	Southeastern Electric Exchange, Annual Conference, Boca Raton Club, Boca Raton, Florida.
12-14	National Conference of Electric and Gas Utility Accountants, New Jefferson Hotel, St. Louis, Mo.
27-29	Chamber of Commerce of the U. S. A., Washington, D. C.

MAY

3-5	Engineering Committees, EEI, Edgewater Beach Hotel, Chicago, Ill.
5-7	Missouri Valley Electric Association, Rural Round Table Discussion and Sales and Rural Conference, President Hotel, Kansas City, Mo.
7-9	Westinghouse Agent-Distributors Association, Hotel Statler, Buffalo, N. Y.
10-13	National Fire Protection Association, Statler Hotel, Washington, D. C.
24-25	Meter and Service Committee, EEI, Lafayette, Indiana.
27-28	Missouri Valley Electric Association, Accounting Conference, (Place to be determined).

JUNE

1-4	EDISON ELECTRIC INSTITUTE, Annual Convention, Atlantic City, N. J.

EDISON ELECTRIC INSTITUTE OFFICERS AND COMMITTEES

OFFICERS

C. E. OAKES, *President*.....Pennsylvania Power & Light Co., Allentown, Pa.
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K. B. CRUMB, *Treasurer*.....American Gas & Electric Service Corp., New York, N. Y.
MAE B. WOODS, *Secretary*.....420 Lexington Avenue, New York, N. Y.

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(Terms Expiring 1948)

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(Terms Expiring 1949)

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(Terms Expiring 1950)

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AUSTIN D. BARNEY.....The Hartford Electric Light Co., Hartford, Conn.
E. F. BARRETT.....Long Island Lighting Co., Mineola, N. Y.
REX I. BROWN.....Mississippi Power & Light Co., Jackson, Miss.
HANCE H. CLELAND.....San Diego Gas & Electric Co., San Diego, Calif.
J. A. LONGLEY.....Central Illinois Light Co., Peoria, Ill.
L. A. MAGRAW.....Central Illinois Public Service Co., Springfield, Ill.
H. B. MUNSELL.....Kansas City Power & Light Co., Kansas City, Mo.
R. S. NELSON.....Gulf States Utilities Co., Beaumont, Texas
C. E. OAKES.....Pennsylvania Power & Light Co., Allentown, Pa.
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O. TITUS.....Metropolitan Edison Co., Reading, Pa.

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EDISON ELECTRIC INSTITUTE OFFICERS AND COMMITTEES

(Continued)

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Pacific Gas and Electric Co., San Francisco, Calif.

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Accounting Division General, H. B. HARDWICK..... Consumers Power Co., Jackson, Mich.
Application of Accounting Principles, H. H. SCAFF.....Ebasco Services Inc., New York, N. Y.
Customer Activities, GLENN RAY.....Indianapolis Power & Light Co., Indianapolis, Ind.
Depreciation Accounting, A. H. KUHN.....Public Utility Engineering & Service Corp., Chicago, Ill.
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Plant Accounting, L. C. PURSELL.....Pennsylvania Power & Light Co., Allentown, Pa.
Taxation, HERBERT S. HOWARD.....Niagara Hudson Power Corp., Syracuse, N. Y.

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Commercial Division General, RALPH P. WAGNER.....New York Power & Light Corp., Albany, N. Y.
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Farm Section, E. C. EASTER.....Alabama Power Co., Birmingham, Ala.
Industrial Power and Heating Section, J. R. HARTMAN.....The Cincinnati Gas & Electric Co., Cincinnati, Ohio
Residential Section, J. M. STEDMAN.....Pennsylvania Power & Light Co., Allentown, Pa.
Sales Personnel and Training, R. S. BELL.....The Commonwealth & Southern Corp., New York, N. Y.
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Electrical Equipment, CHESTER A. CORNEY.....Boston Edison Co., Boston, Mass.
Hydraulic Power, G. R. STRANDBERG.....Stone & Webster Engineering Corp., Boston, Mass.
Meter and Service, W. G. KNICKERBOCKER.....The Detroit Edison Co., Detroit, Mich.
Prime Movers, G. C. DANIELS.....The Commonwealth & Southern Corp., Jackson, Mich.
Transmission and Distribution, THOMAS J. BROSNAN.....Buffalo Niagara Electric Corp., Buffalo, N. Y.

GENERAL

Accident Prevention, E. J. KREH.....Duquesne Light Co., Pittsburgh, Pa.
Industrial Relations, C. B. BOULET.....Wisconsin Public Service Corp., Milwaukee, Wis.
Insurance, I. M. CARPENTER.....Ebasco Services Inc., New York, N. Y.
Membership, J. F. FOGARTY.....The North American Co., New York, N. Y.
Purchasing and Stores, R. S. KING.....Union Electric Company of Missouri, St. Louis, Mo.
Prize Awards, H. M. SAWYER.....American Gas & Electric Service Corp., New York, N. Y.
Rate Research, E. N. STRAIT.....Public Utility Engineering & Service Corp., Chicago, Ill.
Statistical, WINSOR MARTIN.....Public Utility Engineering & Service Corp., Chicago, Ill.
Transportation, JEAN Y. RAY.....Virginia Electric & Power Co., Richmond, Va.
Codes and Standards (a Subcommittee of the Board of Directors). H. B. BRYANS..Philadelphia Electric Co., Philadelphia, Pa.